

THE JOURNAL OF MENTAL SCIENCE

[*Published by Authority of the Royal Medico-Psychological Association.*]

No. 400 [NEW SERIES
No. 364.]

JULY, 1949.

VOL. XCV

Part I.—Original Articles.

THE RESULTS OF A CLINICAL STUDY OF WAR-DAMAGED CHILDREN WHO ATTENDED THE CHILD GUIDANCE CLINIC, THE HOSPITAL FOR SICK CHILDREN, GREAT ORMOND STREET, LONDON.

By CHARLOTTE J. CAREY-TREFZER, M.D.

[Received 21 March, 1949.]

PURPOSE.

THE problem set for this paper was to find out how many children who attended the Child Guidance Clinic at the Hospital for Sick Children, Great Ormond Street, London, during and shortly after the war, showed nervous symptoms caused or aggravated by war experiences or war circumstances; further, to follow up as many of these children as possible to get a picture of the prognosis of such disturbances. One of the main aspects was to investigate the possible relations between type of trauma, set-up of the child, type of disturbance and prognosis.

Many authors writing during the war stressed the relative immunity of children to certain war experiences (Gillespie, Bodman and others); others, however, gave warning of possible after-effects (Freud, Isaacs, Bender). It was hoped that a follow-up would help to solve some of these problems, and give some indications bearing on the care of children in war-time.

Although this paper cannot be of general statistical value, since the number of cases available was too small, a statistical evaluation within the group has been done to assess any significant differences between the completely cleared and the persisting cases, and the different factors represented in each group.

PROCEDURE.

The basic material comprised the records available from the re-opening of the clinic in 1942 to the end of 1946. A few cases who attended after 1946 for the first time and were typical cases of war damage are also included in the study. The follow-up was done in 1947-48.

The number of records seen and their distribution over the different years is shown in Table I.

TABLE I.

Year.	Records seen.	Cases with war damage.
1942-43-	324	84, i.e. 25.9%
1944	171	29, i.e. 16.9%
1945	268	31, i.e. 11.5%
1946	440	59, i.e. 13.7%
Total	1203	203 = 16.8%
Cases after 1946		9
		212

METHOD OF INVESTIGATION.

Each record was read in full, and every case in which the war was mentioned in connection with the child's disturbance was put on the follow-up list.

A letter was then written to the mother or guardian of the child in which our research was shortly explained, and the person asked to co-operate by attending the clinic with the child at a given date. Where no reply was received the writer herself called at the given address. Where the family had moved we tried to trace it through the local authorities, or to get some report on the child through the school. As some of these children had already had a follow-up for some other reason, further endeavours to trace the family were not made.

The following table shows the success of the follow-up:

TABLE II.

Cases with follow-up by investigator	166
„ previously followed-up	18
„ without follow-up	28
Total	212

As far as possible the follow-up included:

(1) Completion of the child's history, bearing in mind the points of special interest for the study.

(2) Re-examination of the child in one or more sessions. Where indicated the child was taken in a play-group for further observation, including tests.

(3) School reports and reports from other clinics which some children had attended were also obtained.

GENERAL REMARKS.

As the clinic was re-opened in 1942, attendance between pre-war years and war-time was not attempted. But as the child population of London fluctuated so much during these years, any comparison of attendances with pre-war years would lack real value.

It is interesting to see that towards the end of the war and after there still was a considerable number of new cases whose disturbances had been caused by the war. This may be partly explained by the fact that many of these children had only recently returned to London and could not have attended our clinic before. Some of them had been seen at a Child Guidance Clinic while evacuated. The majority however attended for the first time when back from evacuation, because it was only realized during the time of re-adaptation to peacetime conditions that the child was disturbed. In other cases the parents had realized before that something was wrong with the child, but they had not been able to make up their minds to seek expert help as long as their lives were unsettled by the hostilities.

Most parents were very co-operative in the follow-up: so were the children, some of whom had become adolescents, but willingly came to the children's hospital again when told that we needed their help.

The general impression when reading the records was that there had been no tendency either by the parents or by the social workers and psychiatrists to emphasize the war when taking the histories of the children. On the whole it was mentioned as little as possible. A few neurotic mothers tried to blame it; in one case for instance the psychiatrist writes: "Mother blames the war; I blame the mother." But we shall see later that such a neurotic mother who was herself upset by the war would aggravate her child's reactions to war-experiences.

The figure of 212 cases seems smaller than what one might have expected, but it confirms the findings of other authors. The main problems even in war-time were those familiar pre-war problems, connected with the emotional development of the child. A child can stand a lot from the outside world as long as his fundamental needs are satisfied. On the other hand, our material shows definitely that some damage has been done and that many children still suffer from it.

RESULTS OF THE INVESTIGATIONS.

We may now proceed to analyse some results of the investigations. The following tables will give a basis for the discussion. Most children showed several symptoms and were disturbed by more than one war-experience, which is why the sum of experiences and symptoms, given in the following tables, add up to more than 212.

TABLE III.—*Experiences Found to have Created or Contributed to Nervous Disturbances.*

Experience.	Cases.	% of 212.
Air raids (actual bombing, sirens, planes, shelter-life)	117	. 55.1
Evacuation	69	. 32.5
Change in family life	79	. 37.2
Loss of schooling	20	. 9.4
Housing problem	32	. 15.0

TABLE IV.—*Disturbances Found, Started or Aggravated.*

Disturbance.	Cases.	% of 212.
<i>Behaviour deviations :</i>	151	71.2
More aggressive	63	..
More inhibited	69	..
Generally nervous	19	..
Fears, general anxiety	118	55.1
Sleep disturbances	42	19.8
Enuresis	36	16.9
Encopresis	18	8.4
Stammer	15	7.9
Tics	21	9.9
Other psychosomatic symptoms (asthma, vomiting, diarrhoea, fits, heart attacks)	30	14.1
School difficulties	65	30.6
Delinquencies	19	8.9
Onset of psychosis	1	0.4

TABLE V.

The children affected :

Boys	129	60.9% of 212 cases.
Girls	83	39.1% „
Previously nervous	142	66.9% „
Nervous parent	114	53.7% „
Nervous mother	90	i.e. 75.0% of nervous parent.

Age of child :

Under 5 when first damaged	125	58.9% of 212 cases.
„ 5 when first evacuated	44	63.7% of the evacuated children.

Intelligence : 146 children tested

I.Q. over 110	47	31.9% of tested children.
under 90	18	12.3% „ „
90-110	73	50.0% „ „
M.D.	8	5.4% „ „

TABLE VI.

State of child at follow-up : 184 cases.

Cleared	38	20.6%
Improved	87	47.3% (plus 11 improved without follow-up).
Persisting	59	32.1% (plus 17 persisting without follow-up).
Psychotherapy (6 and more consecutive sessions)	67	32.0% of 212 cases.

TABLE VII.—113 Cases with Clear Onset of Symptoms after One Experience.

Damage.	Cases.	Persisting.
Raids	42 .	15 = 35.7%
Evacuation	46 .	25 = 54.3%
Change in family	25 .	8 = 32.0%

TABLE VIII.—Symptoms shown in Cases of Table VII.

Symptom.	After raids.	After evacuation.	After change in family.
Behaviour deviation	27 (64.2%) .	33 (71.7%) .	22 (88.0%)
Anxiety	35 (83.3%) .	13 (28.2%) .	1 (4.0%)
Enuresis	10 (23.8%) .	9 (19.5%) .	3 (12.0%)
Encopresis	5 (11.9%) .	4 (8.4%) .	1 (4.0%)*
Stammer	4 (9.5%) .	3 (6.5%) .	3 (12.0%)
Tics	5 (11.9%) .	6 (13.0%) .	3 (12.0%)
Other psychosomatic symptoms	8 (19.0%) .	3 (6.5%) .	0
Delinquency	0 .	15 (32.6%) .	0

I. THE DAMAGING FACTORS.

We shall now proceed by first considering the problem as seen from the angle of the damaging factor, and later from the set-up of the child affected and his reactions.

We see from Table III that air-raids show the greatest number of reactions, followed by changes in family life. Yet in the detailed study of the cases it appears that evacuation has been predominant in creating deeper and more persisting damage. The statistical evaluation of the cleared and persisting cases confirms the clinical findings, namely that damage caused by evacuation shows a definite tendency to persist, whereas bombing shocks were likely to clear more easily if no other complicating factors intervened. Disturbances from air-raids also proved to respond better to psychotherapy than those created by evacuation. Also changes in family life seem to have created disturbances which showed a tendency to clear when the family settled down normally after the war. In the persisting cases we find again that for the most part there are other complicating factors.

In Tables VII and VIII we have sorted out a number of cases in which symptoms started following a single experience. Out of these 113 cases, 42 started their symptoms after air raids, of which 15 (i.e. 35.6 per cent.) persisted; 46 started after evacuation, of which 25 (i.e. 54.3 per cent.) persisted; finally 25 started their disturbances after a change in family life, and 8 (i.e. 32 per cent.) of these persisted. This confirms the tendency indicated above. We shall later come back to these 113 cases in connection with the disturbances created by each of the experiences.

I. Air raids.

The follow-up indicates that anxiety and other symptoms due to the bombing cleared or greatly improved after the bombing ceased. Among the persisting cases (see Tables of Statistics 1a and 2a) the combination with a nervous parent is significantly often found. The histories reveal that a mother's neurosis not only aggravated the reaction of the child at the time of the damaging experience, but also that her emotional instability prevented the child from settling down later. Amongst these children we find many whose intensity of reaction is not correlated with the intensity of the damage. They reflect much more the reaction of the mother. On the other hand, we have children who showed very little reaction to most alarming incidents, perhaps because their mothers managed to remain calm at the time and after.

Some histories may illustrate this :

CASE 1.—Sylvia R—, Reg. No. A106. Parents not nervous; child normal before. When aged 9 the house was severely damaged by a bomb while the whole family was in bed; all buried under debris. The parents made no fuss; they all got out without major injuries. After that Sylvia showed general anxiety and became backward at school. When seen at the clinic an anxiety state was diagnosed, but no treatment given owing to circumstances. Re-housing was supported, as the family had to live in very overcrowded conditions with neighbours. Follow-up: Cleared completely after moved to new house. Picked up very well at school and now has a good job.

CASE 2.—Jean J—, Reg. No. C177. Parents not nervous; child normal before. When aged 7 a bomb dropped near the school: the children were buried in a shelter, two dead. Jean was fetched home by a neighbour; she was very pale, did not talk or cry. When the mother came home she started screaming for half an hour; the mother finally managed to comfort her. After that event Jean was terrified of sirens and planes, and became very difficult, had screaming fits in which she was very destructive. Follow-up: Cleared completely without therapy. Short relapse during evacuation two years later.

CASE 3.—Ann J—, Reg. No. G63. Parents not nervous; child not nervous before. When aged 8, on her way home from school alone, a flybomb came straight towards her. She was grabbed by a workman, who dived under a hedge with her. The bomb fell near and both were slightly injured. Ann screamed so loud that her mother heard her several houses away. She took her home and comforted her. Ann was terrified of flybombs after that, became generally nervous, afraid of the dark, afraid to go alone to the lavatory. The symptoms cleared completely without therapy.

Now some cases where a nervous mother interfered :

CASE 4.—Pat. W—, Reg. No. F198. Normal child before. Mother always a bit excitable; "a bundle of nerves since the bombing." When the child was 4 a bomb fell near their house and they were covered with debris and rather badly injured. Pat was brought to our hospital with her brother, the mother to another; then all went together to a convalescent home in the country. Pat had developed very bad nightmares and was generally afraid. In spite of therapy she still has them, and the main cause now is her mother's severe neurotic behaviour. She has constant complaints, which she puts on to the bombing, and is badly in need of psycho-therapy, as she upsets the whole family.

CASE 5.—Margaret K—, Reg. No. G125. Child a little afraid of the dark when small. Mother very nervous since the bombing. When child aged 6 bombed out and buried under debris. The mother was terribly upset; cried loudly. Margaret

was not so upset apparently and told the mother she would stop crying if she (the mother) stopped! Mother and child were injured; later both found to have slightly fractured skulls. The sister had to stay in hospital; the others went to a rest-centre and then were put up in a hut; then mother and children were evacuated. Margaret, who had already been very queer and quiet in the rest centre, gradually developed strange, obsessional behaviour, fears of being suffocated, of sleeping alone, of being poisoned. She only attended for treatment two years later, and it was found that the mother was mainly to blame for the intensity and persistence of the child's symptoms, as she was constantly talking of the bombing and of the fractured skull which she blamed for the child's "illness." The sister, unconscious after the same bombing, who had no fractured skull, did not worry the mother at all, and it was only by chance that the mother mentioned that this child developed a severe stammer and nightmares. This case will be mentioned later.

CASE 6.—Sonja S—, Reg. No. E238. Mother always nervous, terribly upset by the war. Austrian by birth; married an Englishman shortly before the war. When Sonja was 4 a bomb fell behind the house on the railway-track and damaged the house. Mother and child were at home; the mother "scared stiff" and the child accordingly upset. Since that day she stammered and wetted her bed again. Before she had spoken perfectly well, had been dry, but always a little difficult to manage. She became more difficult after that. Treatment was proposed, but the mother failed to bring the child again. Follow-up at home: Mother extremely highly strung; talks in front of the child about all the upsets during the war and how unkind people were to her. Most unbalanced in her way of handling the child, who appears spoilt and self-willed. Still stammers a bit, enuresis persisting, but varies a lot. Strong jealousy of the baby sister.

CASE 7.—Royston H—, Reg. No. C114. Normal child before. Mother not nervous before the war, but upset by bombing and later by family trouble. When Royston was 6 they were bombed out, not injured, but saw dreadful scenes in the street. After that he developed a nervous asthma and multiple tics, bad sleep, inhibited. He was then evacuated to the country with his mother and improved a lot at the beginning. But after a time the mother got very worried, as she could not return to London and her husband did not seem to want her back. Roy got gradually worse again; had severe attacks of asthma. The husband eventually deserted the family and the mother had a nervous breakdown. She came back to London to her mother and attended with Roy for the first time, with tics so marked that a chorea was first diagnosed at the out-patients, but then the real trouble discovered and referred to the C.G.C. No treatment, as mother left for the country again. Follow-up: Mother remarried. First Roy much better; very kind stepfather. Now mother near a breakdown again, as she expects a baby and the housing conditions are appalling. Roy worse again.

This last case demonstrates especially well how the child's condition oscillates with the mother's emotional upsets. The desertion of the father in itself would not have upset him, as he never saw much of him. The latest relapse may, however, partly be caused by jealousy of the expected baby.

Another factor which seems to have influenced unfavourably the healing process of bombing neuroses is an immediate evacuation alone after the shock. This happened quite often. These children had mostly shown no fear of the bombing before, and were kept at home till an incident decided the parents to remove them to security, especially if they had developed disturbances.

We know from experiences with adults that shocks should be treated at once, and that their prognosis is not bad if this is carried out. Unfortunately the children were often sent away alone to strange surroundings without having been previously treated, and it is not astonishing that this new strain, added to their previous damaging experience, would prevent them from getting

over it. In fact we see that in many cases the symptoms were aggravated and new disturbances appeared, as shown in the following examples :

CASE 8.—Anthony P—, Reg. No. E279. Child not nervous before. Mother upset by bombing ; had a heart attack when bombed out ; still on the nervous side. When Tony was 5 the family was bombed out. Mother and children were under a table shelter, not injured, but the house badly damaged. The mother then had what she describes as a heart attack and cannot remember much. Tony developed a severe stammer and facial tics. He was then evacuated with his brother, who showed no disturbances. No treatment before evacuation. Both boys travelled together in a party to Wales. Arrived at a village, the children had to stand in a row and the people came to choose them. A lady who “ really wanted girls ” took them in the end. She was quite kind, but got very impatient with Tony, and believed he was “ not quite right.” When he came home he had got much worse, and had become very inhibited. Treatment was eventually started at the clinic ; he improved for a time, but has relapsed since.

CASE 9.—Ann W—, Reg. No. E102. Mother had a nervous breakdown during the blitz ; she is often ill. When Ann was 7 their house was badly damaged by a bomb, but as they lived in a basement flat they were not injured. The mother was very upset ; the children seemed not much afraid, but Ann developed a stammer. She and her sister were at once evacuated to Wales for 4 years and visited fairly often. Ann seemed not unhappy, but her stammer got worse. Back home she had become very difficult to manage, very stubborn and self-willed. She refused to be treated for her stammer after she attended a C.G.C. On the follow-up she showed a severe stammer, which she tried to dissimulate by talking as little as possible ; she seemed discontented, full of resentment against her mother.

CASE 10.—George A—, Reg. No. A33. A normal child before. Parents not nervous. When aged 7 a landmine fell opposite their house, destroyed several houses and killed many people. Their house was badly damaged. George developed faecal incontinence and was evacuated to a hostel. There he became enuretic, and as he seemed miserable he was fetched home. At home he proved to have become generally nervous and miserable, and his dual incontinence persisted. He was taken on for treatment, but the mother failed to attend. On the follow-up the mother was very reluctant in giving information. The encopresis had apparently cleared ; he was still enuretic and difficult. He was seen in bed with ‘flu, but stayed turned to the wall and would not answer questions.

This leads us to the problem of neurotic disturbances after—

2. *Evacuation.*

The clinical study has revealed without doubt that evacuation has played a major role both in aggravating neurotic symptoms and in creating deep and persisting disturbances. Some have improved, few have cleared, many are still persisting. Almost all the “ difficult ” and long treatment cases are evacuation cases. Among the persisting group evacuation figures in 67·8 per cent. of the cases ; in the cases shown under Table VII evacuation also shows the highest percentage of persistence. We shall later see why children reacted in this way, but one point may be mentioned here : We find that 63·7 per cent. of the children who presented problems after evacuation were under the age of 5 when first evacuated. This confirms the findings and apprehensions of other authors (Freud, Isaacs, Bender, John and others), who foresaw the dangers of evacuating young children. We see that it was in principle wrong to evacuate young children without their mothers. The question of a suitable billet had

little bearing in their case. The mere fact of being separated from their mother, even to a good billet, was enough to create a neurosis in many a child. Besides, young children had unfortunately very often to undergo frequent changes of billet, as they were mostly evacuated first with a nursery, then when they became too old for a nursery, removed to a home or private family, which very often had to be changed again when the child started school. They had therefore even less chance to settle down in a foster home after the separation from their mother and to adjust themselves to the new situation—a chance which older children had as a rule. Changes were bad enough for older children, but really detrimental for the young ones.

Other children badly affected by changes were those who were already neurotic before evacuation, or had become so during evacuation and were therefore undesirable to foster mothers. The vicious circle of neurotic behaviour due to changes and changes due to neurotic behaviour went on and some of these histories read like tragedies.

In older children we find that as well as the separation from their home, the unsuitability of some foster homes, guilt over having left their parents in danger, jealousy of siblings who remained at home and anxiety over the dangers which threatened their parents added to the emotional difficulties created through evacuation. The climax was often only reached when these children came back home, deeply disturbed and insecure. They then were rejected by parents, who could not understand why their previously "nice" child had become such a monster.

We also find that children who had previously been unafraid of raids showed great fear of the bombing when back from evacuation, and were therefore evacuated again. Parents who were able to grasp the dangers of evacuation as well as those of the bombing were facing a real dilemma as to what was the right thing to do.

Some typical cases may illustrate what has been said :

CASE 11.—Edmund W—, Reg. No. D264. Normal, only child. Cried a lot as a small baby, but later very good. The mother was not nervous before, but became nervous of the bombing, and so she decided to evacuate the boy. Evacuated, aged $3\frac{1}{2}$, to a very nice family with children. But he cried all the time, did not eat nor play, called for mummy all the time, so that the mother was asked to take him home after 10 days. At home he clung to her desperately, and when he started talking again he had a severe stammer and facial tics. Before he had spoken perfectly well, but was left-handed. He had no treatment at the clinic, as the mother could not face coming up during the bombing. He was not very scared of the bombing, but developed enuresis during the worst of the blitz. This has cleared again, but the stammer is still persisting and the boy is generally nervous.

CASE 12.—Ernest B—, Reg. No. D258. Parents not nervous before, but the many post-war difficulties have made the mother very nervous. She cannot cope with Ernest and her husband, who has arthritis of the spine. Ernest a good baby till 2, clean, normal. Aged 2, was sent to a residential nursery for three weeks; when fetched home he was easily frightened and wetted the bed; he has never been quite dry since. During the blitz he was very frightened and had screaming fits. He was therefore evacuated, aged 3, first with his mother for a short time, then she went back to London and left him there. He was soon removed to a hostel because of his bedwetting. There he broke his leg, was moved to the Sick Bay, then moved several times. In 1943 the mother visited him and found him so thin and miserable that she looked for a private billet. A very kind lady took him, but she reported that

Ernest was always so quiet, hardly talked and never played. He wetted constantly. The mother then took him home. Attended first in 1945, a miserable, thin, pale-looking boy, who was first sent to the medical department to make sure that he was not physically ill. He was withdrawn and his activity practically *nil*. He has been under treatment ever since, improved for a time and got rather naughty at home, which was not at all appreciated by his father. He is now really rejected by his parents, is truanting from school, pilfering money from his mother, and we have very reluctantly had to put him on the list for a school for maladjusted children.

CASE 13.—Kenneth Q—, Reg. No. E72. Parents not nervous. Normal, friendly baby till evacuated. Sent to a Red Cross Nursery, aged 2; visited fairly often. First only cried, would not talk to father, then seemed to settle down. Aged 3½ removed to a home, parents lost track of him for 11 weeks, and when they visited him he did not know them and seemed another child. The matron of the new home made a great fuss of him, but gave little information about him. The parents visited him several times, accompanied by their two elder boys, who were then at home. Kenneth came home in 1946, after having been away for 4½ years. The matron brought him to London, and both cried bitterly when parting and kissed one another. Kenneth cried for her during two days; he was first quite a stranger at home, then gradually became very naughty, especially towards his father, and over-attached to his mother. He began to be very aggressive to his father and playing tricks on him; he attacked him several times, once with a knife. He also began to pilfer money from his mother. In bed he masturbated and wetted every night. No punishment improved him; he never cried when beaten, showed no fear of parents or teacher. At school he was defiant, challenged everybody, was destructive, had no friends, and was a very bad scholar. But the teacher, who had some understanding of the situation, described him as a sensitive boy, easily moved by stories. The only fear he showed at home was that he might be sent away, and the parents soon used this as a threat, but naturally it did not improve him. The parents now definitely think that he is not their child and has been exchanged when moved to the home. The brothers, who are very good boys, reject him equally. The family is very united, and Kenneth is more and more an outsider. He has had intensive therapy for over six months, but the attitude of the parents undoes all improvement. On the other hand, one must admit that the parents have to put up with a lot.

CASE 14.—Jeannette L—, Reg. No. D298. The mother was never nervous, but since J. is back home she has become so. Father deserted the family when J. was 1 year old, mother remarried. J. evacuated when she was 2 years old, for five years. She was a normal, good child before. She was not visited. First she was evacuated with a nursery, then changed the nurseries twice. When 5 she was billeted on a foster mother; it was a compulsory billet. She started school then, and in winter had to be carried over the fields to the main road; she was given sandwiches for lunch so that she had not to come back at midday. From this billet comes the first report on the child. She was apparently a difficult child, and would not mix. The foster mother was glad to get rid of her and she was sent to a home. A report from this home says that she was a most difficult child, negativistic, producing screaming fits and going round and round in circles when she could not get her own way; most destructive and aggressive towards other children. She never joined a group in play or work. From there she was removed to a private house again, but was so difficult that she had to be put into a home for difficult children. From this she was again moved to another where psychiatric treatment was available. A very good and detailed report from this place describes her first as completely detached, saying strange things, like "Nobody makes me happy but myself." "If I was burned I would not be here, would I?" "My mother is perhaps dead; I don't know." She had very bad manners—did not care about anything. The first real relationship she probably ever had since she left home started then between her and the psychiatrist. She slowly became more civilized, began to co-operate and to care about her looks. Her drawings, which had first been gruesome figures, became neat, houses with flowers, etc. Just when she began to experience a normal way of living with people and gained some sense of security she was taken home. At home she soon became as difficult as she ever had been; she said she hated everybody, kicked and wanted to hurt. At times she was sulky and sucked her fingers, at others she had screaming

fits. She was alternately over-attached to her mother, then again attacked her and pilfered money from her bag. She was taken for treatment, improved a bit, but showed intense hostility towards her mother. Therapy was discontinued, as the mother failed to bring her, and the latest report is that she has been remanded for stealing. The home care at the same time appeared perfunctory.

CASE 15.—Peter D—, Reg. No. D322. Father died; mother remarried while Peter was away. She worried a lot during that time, and kept no contact with her evacuated children. Peter had tempers as a baby, otherwise he was normal and lively. Evacuated when 4, first to a private billet, then to a hostel, as he fell ill. Moved several times; back home after 4 years; never visited by mother. She describes him as a different boy; he was quiet, looked old, had a cowed expression and showed no feelings. Then he became more and more out of hand, became aggressive towards his stepfather, pilfered money from his mother and was very jealous of his baby sister. The stepfather, who is a very kind man, tried hard to improve him, but when he started truancy from school and was remanded for stealing, the parents gave it up and sent him to a foster home. His one year older sister, who had been evacuated at the same time, came home a little later, even worse than Peter, "and she was so good before, had not even tempers like Peter." She has also been "put away." She was not our patient, but Peter attended several times, but was not taken on for treatment, as the parents had already made up their minds not to keep him at home. They feared that these two children would ruin their marriage.

CASE 16.—Audry F—, Reg. No. B268. Parents not nervous. Child normal till 5. Started school normally, but became afraid of a teacher with a "sharp voice." She then developed a blinking tic. After a short period of treatment at the clinic and change of school she was all right again. Aged 9, in-treatment again because of panic during the raids, sleep-walking and masturbation. After a few sessions she was evacuated, as she was so afraid of the bombing. She first seemed quite happy, but after the first visit from her parents she became depressed and cried constantly. She was fetched home. There she showed greatly disturbed behaviour, she hardly talked, clung to her mother, would not mix at all and refused to go to school. She also showed many fears, but was not afraid of the rockets. She was again taken on for treatment; an anxiety state was diagnosed. After a time it was decided to put her into a school for maladjusted children, and pending that treatment was discontinued. She was followed up twice. In 1947 she appeared much better, she had started school again and the parents had decided not to send her to a special school. She mixed well at school, had picked up rapidly and was now of the same standard as the children of her age. She showed no fears and looked a happy child. A year later she was again seen. In the meantime she had lost a beloved kitten and had relapsed for a few weeks, stopped talking, was very depressed, but continued to go to school. When seen at the clinic she had been waiting in a waiting room where children came for tonsillectomy, and the mother said that while waiting she began to show fear again, sat without talking, and when asked to come into the consulting room she just sat like a catatonic and refused to move, although every endeavour was made to reassure her.

CASE 17.—Stanley J—, Reg. No. A29. Parents not nervous. Child easy before evacuation, not nervous, but still wetted the bed occasionally. The youngest of several children. Aged 6, evacuated to Bristol, was sent to a sick bay because of his enuresis. There he started soiling and showed great fear when the bombing started. The mother, who had to stay in London, took him back when the Bristol raids started. In London, however, Stanley was terrified of the warnings and planes; he wetted and soiled himself constantly, so that the mother reluctantly evacuated him again when the bombing got worse. They found a foster-mother who did not mind his soiling. When visiting him several months later the mother found him so neglected and dirty that she took him home as soon as the bombing decreased. At home he appeared to have become a real little savage; had no manners, no discipline, was completely out of hand and as dirty as ever. He was still terrified of the warnings. He was brought to the clinic, then referred to a hostel outside London, where he had psychiatric treatment. His soiling improved,

his behaviour, however, got worse, and the mother felt that the other boys had a bad influence on him. She took him home before he was discharged. He has improved, but has still to be kept well in hand. He has no fears, does not soil, but wets the bed occasionally and is not much good at school.

Going through the records of the clinic we also came across histories where it was stated that children had improved during evacuation. Some enuretics had stopped wetting while away and started again at home; others had improved in behaviour. One girl who had been difficult to manage at home ever since her father died found a good foster home which made up for her loss. She returns there each holiday and the mother has had no more trouble with her.

It should be stressed at this point that our material cannot compare with the material taken for Evacuation Surveys from the average "normal" population, where the results of evacuation seem to have been very satisfactory on the whole. Our material is selected by the fact that it is clinic material. A general study of evacuation does, however, not lie within the scope of this study. From the clinic material we find that in those cases where damage was done by evacuation, it has been deeper and more persisting than disturbances caused by other war experiences. It is therefore worth while trying to discover which type of child is the more likely to be disturbed, so that they may not be evacuated should the necessity for another scheme arise.

3. *Changes in Family Life.*

Seventy-nine, i.e. 37.2 per cent. of all the children investigated reacted neurotically to changes in family life. This section does not present really different problems from those in peace time. The only difference is that the war has increased changes in the home life which have a disturbing effect on children. We find that the absence of the father in itself did not so much affect the children if the mother kept her balance and could look after the children properly. Whenever she worried unduly or had to go out to work problems arose. One new aspect compared with peace time changes was the return of the father to a family which had for years been used to getting on without him. Apart from the difficulties which often arose between the parents, children resented the father as an intruder, and we find strong reactions of jealousy, especially among young children who had not yet formed a relationship to the father before he left. Amongst older children we have some cases where the parting from the father to whom the child had been very attached caused a neurotic reaction. But on the whole the behaviour of the children strongly reflected that of the mother, and all symptoms showed a tendency to clear when the family settled down after the war. In some cases of discord in the home the absence of the father improved a child.

4. *Loss of Schooling.*

Only 9.4 per cent. of the children of this study suffered considerable loss of schooling, either through closing down of their school or through being evacuated, but we found that 30.6 per cent. showed school difficulties. This reflects the degree to which emotional disturbances affect the capacity to learn. We are

impressed that these children picked up so quickly at school, when the neurosis cleared. In this connection it is interesting to find that the I.Q. of the tested children was mostly within or above average (see Table V).

5. *The acute housing shortage* has definitely aggravated the symptoms of many a child and delayed progress. It is found in 15 per cent. of the cases.

II. THE CHILDREN AND THEIR REACTIONS.

After having dealt with the problem from the point of view of the damaging factor, we shall now proceed to analyse it in relation to the child affected. As already seen in the previous chapter, and as has been shown by authors who dealt with the problem in war-time, children have generally reacted to war-experiences, particularly to the bombing, in a way different to what most people expected. Anna Freud and many others have explained their reactions in the light of the different make-up of a child compared with the adult.

To mention the main points, unless immediately hurt the child has proved to be rather indifferent to bombing. It is not shocked like adults by the sight of destruction. On the contrary, the younger a child, the nearer it still is to its own destructive instincts, and the sight of destruction arouses more likely excitement than horror. The older the child gets, the more these primitive instincts have been suppressed, and the sight of destruction arouses anxiety. Therefore we do not find in younger children neurotic reactions to the sight of destruction; they will only appear if a child has been in imminent fear of danger, experienced personally. On the other hand, the feeling of security of a child depends almost entirely on the attitude of the adults nearest to him, mostly on the mother. The younger the child is, the less he is capable of fighting danger himself, and the break-down of the mother will automatically mean a break-down of himself. Therefore a young child, in his reaction to unknown danger, reflects the reaction of his mother to it.

The older a child gets, the more he will be able to understand the reality of the danger, and his reactions will be according to his own means of fighting or escaping it. Besides this experience of real danger, at certain periods of their development children will identify outward danger with their own suppressed aggression or with their own conscience. This will create anxiety which will not depend on the intensity of the danger, but on the intensity of their inner state of aggression and guilt.

The child's reaction to evacuation again depends on his state of development. The younger a child is, the more closely he is attached to his mother, and evacuation will first of all mean a break in this attachment with its security and pleasures. The dangers which a break in this important relationship means to the emotional life of a child are well known. In an older child the separation in itself will mean less danger, but other complicating factors, such as anxiety over the parents, guilt for having left them, jealousy of those siblings who remained at home, difficulties in adapting to the new home, and finally, feelings of being rejected by the parents, can prove to be a great strain on the emotional life of a child, and may easily induce neurotic reactions.

Changes in the family life due to the war do not differ from those which may occur in peace-time, with the exception of the long absence and return of the father. A young child will not take much notice of his father's absence, as he is still too much involved in his mother-relationship, but he may much resent his return, which partly takes the mother away from him.

If we now turn to the way in which a child can abreact emotional upsets we again find a considerable difference from adults. The adult normally abreacts emotional tensions by conscious thought, verbally expressed. A child, especially a young one, rarely uses this outlet. He expresses himself through his behaviour and his play, which reflect his experiences as he was able to grasp them. Such temporary "behaviour deviations" following a shock help the child to get over it, and they mostly disappear after a time, without treatment. Only when the child is incapable of regaining his balance by this means may these temporary disturbances become permanent and other symptoms may appear. The child has become neurotic.

The most frequent forms of changed behaviour are regressions to earlier stages of development, obsessive behaviour and play, and emotional withdrawal. Regressions and emotional withdrawal mostly occur when a child is robbed of parental love, whereby he loses the incentives to control his more primitive instincts and become "grown up." After acute fear we more often find obsessive behaviour and restriction of activity. Psychosomatic symptoms are also frequent in children, but the purely hysterical reactions are seldom found in young children; their incidence increases towards puberty.

Having made these points, let us look at our material in the light of their implications:

In Table IV we find that the disturbances of behaviour head the list, followed by fears and general anxiety. Table VIII, which gives us the main symptoms started by a single experience, shows that after a bombing incident 83 per cent. of the children showed general anxiety and fears, 64 per cent. changed behaviour. After evacuation and changes in family life the behaviour disturbances predominate, i.e. 71 per cent. and 88 per cent. respectively. The psychosomatic symptoms are less frequent and about equally seen as a result either of bombing, evacuation, and change in family life. Enuresis and encopresis are more often found after bombing, but we must differentiate here between the more complicated forms of incontinence which we find as syndrome of a neurosis, and which are to be considered either as a regressive or an aggressive act. They are more often found in the persisting cases. The other form of incontinence which we found after bombing incidents as a result of acute fear appears more as a psychosomatic symptom, the bladder and bowels being constitutionally "weak points" in these children. The "choice" of psychosomatic symptoms amongst these particular children seems to be far more dictated by the constitution of the child than by the nature of the damage. For instance, we find that stammer occurred in about the same percentage of children in each group of war-damage. The examination of the stammerers, however, discloses that about two-thirds are left-handed.

In Case 5, cited before, Margaret K—, we have seen that of the two sisters who both experienced the same trauma, the one who was nervous and had

fears before, reacted with obsessional behaviour and neurotic fears. The other, normal before but left-handed, developed a severe stammer, but no other neurotic behaviour.

Amongst our children, who were all under the age of 12 when they first attended the clinic, we have no case of pure hysteria after a war incident. One case may be of interest here—Pauline W—, Reg. No. B224. She became neurotic after her father, to whom she had been very attached, left for overseas. After having been bombed out she had not been disturbed, whereas her 17-year-old sister lost the use of her legs after this incident.

An outstanding fact is the occurrence of delinquency after evacuation only. The delinquencies in our cases are all of small order, mostly pilfering money from the mother. None of these children was a court case; four have become court cases later. These small thefts have proved to be part of a neurotic syndrome in children who felt rejected. Only 8.9 per cent. of all the children in this study were minor delinquents, and of these only one boy was later remanded for breaking into a house with some older boys. If we compare these figures with those given by authors of occupied countries they compare very favourably. The reason lies in the different original factors which are the cause for these delinquencies. When examining a great number of refugee children from occupied countries in Switzerland, the high incidence of major delinquencies was found to be due to a lack of moral defences and not to neurotic disturbances. The same probably applies to the increasing number of court cases amongst children and youths in this country. These children would not attend a child guidance clinic for psychiatric treatment; they present an educational problem.

We now come to the question of the importance of the fact that a child had been nervous before the war damage. Theoretically it was to be expected that a greater number of previously nervous than of normal children would be affected by war-disturbances. Among all our cases we find that 66.9 per cent. were nervous before. The statistical evaluation of the cleared and persisting cases does, however, not show any significance between previous nervousness and persistence. Yet when we study the records of these previously nervous children we are impressed by many in which a previously nervous child has reacted far more to an experience than, for instance, his normal sibling. We are therefore inclined to say that previous nervousness of the child increased his chances of being disturbed, although it apparently had no significant bearing on the prognosis of the disturbance.

Some examples :

CASE 18.—Harry K—, Reg. No. A54. Parents not nervous, nor the numerous sisters and brothers. Some time before the war, Harry, who was a normal placid boy, went to see a murder film, and was so frightened by the face of the murderer, which appeared at a window in the dark that he was terrified of entering a dark room or sleeping alone ever since. When the war started he was 10. During the black-out his fears increased; he used to imagine faces behind the black-out curtains and get very agitated. When the raids started he became terrified; he ran about the room like mad, and they all had to hold him. He experienced no near hit; the sound of sirens and planes was enough to make him "hysterical." None of the others were afraid. When the raids decreased and after he had been to the country for a short time his fears slowly disappeared. He was hardly afraid

of the flybombs, although their district was far more hit by those than by the blitz, and at the follow-up he had lost all his fears.

CASE 19.—James W—, Reg. No. A46. Parents not nervous. James was always a nervous child. As a baby he was upset by noises; later afraid of storms and water. Aged 3, he had a nervous stammer. He never mixed well; was very jealous of his younger brother. During the blitz his nervousness increased, although he never experienced a near hit. During the flybombs he got so terrified that the parents decided to evacuate him with the younger brother, who never had been nervous and was not a bit afraid of the bombs. He used to watch them come, and when one passed he laughed and said: "Now let's see what is coming next." James was much better when evacuated, but worried a lot about his parents. In every letter he used to write: "What shall I do if something happens to you? I want to die with you." When back home he had to go to another school. After a time he complained that he could not walk and stopped going to school. He attended a Child Guidance Clinic and a hysteria was diagnosed. He had treatment, and improved, went back to school. On the follow-up he had lost some of his fears, but was still a difficult, moody boy, a bad mixer, and his work at school varies a lot. He is never really happy.

CASE 20.—Jean L—, Reg. No. B95. The mother is highly strung. The child showed fears ever since she had been sent to hospital with scarlet fever when 2½ years old. She also had developed nervous tics then. During the war she was terrified of sirens and planes, and all her symptoms increased. She improved with treatment, but relapses whenever a new strain is put on her, e.g. change of teacher.

Again a child may have appeared normal before damaged, yet there may have been a constellation of events or of inner conflicts which prepared the terrain for a neurotic reaction. Going through the records we have come across cases of severe and persisting reactions to events which seemed not to justify such disturbances. It was not possible in every case to find out why that child had been so severely upset by an experience which did not upset others. We are therefore most grateful to the Crayford Child Guidance Clinic for leaving at our disposal a case which illustrates to perfection the deeper structure of this kind of "war neurosis."

The history given here is chronologically reported as it revealed itself during therapy. The child was brought to the clinic because it had presented a problem ever since it had been bombed out. According to the mother she had been a normal, lively child before.

CASE 21.—Sheila M—, born 1939; brought to the Crayford C.G.C. in September, 1947. Problem: Since bombed out in 1944, when staying in hospital with whooping-cough, the child had become completely withdrawn. For two weeks after the incident she stopped talking completely, since has talked little, refused to eat, become very quiet and has made little progress at school. To the previous history, the child had developed normally and presented no problem. When she was 5 a baby brother was born. Sheila showed no jealousy, no different behaviour. A few months later both children developed whooping-cough; Sheila was sent to hospital, and the very ill baby kept at home. The girl seemed not upset to go to hospital. Whilst in hospital the building was demolished by a bomb; some children were injured, but none killed. The mother could give no details of what exactly happened, and Sheila had never mentioned the incident to her. She was taken home and the changes in behaviour described above were noticed. She had no physical injuries. No other child who experienced that incident was brought to the Child Guidance Clinic with nervous disturbances.

Treatment started when the child was 8; she was sent to the C.G.C. because she made no progress at school. At first she was extremely repressed, mono-

syllabic, and without a resilient emotional expression. "Responds to purely intellectual situation, but where she needs to call upon her passionate energy she becomes dumb and with a schizophrenic appearance." Her I.Q. was 123. For about two months weekly interviews made little difference to her behaviour. Then a casual question when she was helping construct material prompted her to tell of the hospital incident: "I could never forget it—I thought they were all killed—the nurses carried us out—I was the first one out—there was great heaps of glass everywhere—I was terribly upset—I was the first one out—I was the first one out!" Two questions (Did they take you to another hospital? and, Was anybody killed?) were answered solely by shouting, "I was the first one out."

After this the mother reported that she found great improvement in the child at home. At the clinic a great deal of indirect interpretation was now used, and the child became extremely aggressive. The game of "rockets" was played for a considerable time each week. She became intensely alive and noisy. In the meantime another baby was born at home; the girl was first shocked to talk about it and babies in general; then she said she was glad it was not wrong to think about these things.

Eight months after the beginning of treatment she retold the hospital incident, saying for the first time that it was because she had to go away but mother kept the baby at home that made her feel so "awful." She was now quite able to discuss her feelings at the time, and said frankly that she felt she hated Mummy and the baby, and wished they would die. Asked if she felt like that about other people in general she said, "That was exactly how I *did* feel." Asked what she thought when the rocket fell she almost shouted, "I thought it *had* happened," meaning she thought her wish had come true.

It was during the few minutes after she had been taken to safety and was there alone, "the first one out," that she felt sure that all the other children had been killed and only she was left. This coincided with her wish.

The improvement after this was very rapid, and she became normally extraverted, mischievous and full of life and enjoyment.

October, 1948, still attending, now in a group, and can be said to be a normal happy child.

This case does not need comment; it speaks for itself. But it also shows how complex any research work becomes when psychological factors are involved. Without this skill (and luck!) in therapy such a case would pass as persisting bombing-shock in a previously normal child. Yet the hidden psychological conflict was far more important for the reaction than the bomb, which might have been replaced by any other drastic incident—say a thunderstorm. Again, the same child would probably, a few months earlier, have gone undamaged through the same experience, like the other children in the hospital. Even if the histories are taken with great care, many psychological factors may have passed unnoticed and yet have been most important, for the development of a neurosis and psychotherapy does unfortunately not always reveal so clearly what actually happened in the child. This instance illustrates well how easily such cases may falsify a statistical survey which stops short of any inquiry as to the deeper nature of the disorders.

A schizoid withdrawal, as shown in the previous case, has occurred in several children of this follow-up.

In four cases the diagnosis schizophrenia had been considered; three have been relabelled as neurosis. One girl, Case 16, cited before, has at times presented a picture very near to that of a catatonia. A boy, Robin G—, Reg. No. A61, who began a bad stammer after a raid, became very withdrawn, showing no emotions, and produced drawings which were very suggestive of schizophrenia. At the follow-up he appeared quite normal, but rather introverted. A third

case, Ann R—, Reg. No. B274, had become very queer after her father left. She had been very attached to him and stopped talking after he left, showed strange mannerisms, giggled to herself and became very withdrawn and aggressive at times. She was treated for two years. First her behaviour at the clinic was very suggestive of schizophrenia, but treatment revealed a severe neurosis, later aggravated by the birth of a baby. She is now a normal, happy child. A crisis occurred during treatment at the return of her father, as his role had been taken over by the psychiatrist. He was, however, slowly re-installed in his proper place. The fourth case presents the only one among our material where a schizophrenia seems to have been precipitated by an air raid incident.

CASE 22.—Valerie A—, Reg. No. E26, was an apparently absolutely normal child before the incident. When she was 5 a flybomb fell near their house. She screamed for two hours, then went into convulsions. After that she had no more convulsions for one and a half years, but slowly deteriorated, stopped talking and became very autistic. She still presents a picture very suggestive of schizophrenia. The EEG shows no changes suggestive of organic brain damage, but is characteristic of epilepsy.

Amongst adults acute onset of a schizophrenia after raids has been seen (Gillespie). In this connection another case which came to our notice after the follow-up was closed is interesting :

Pat. H—, Reg. No. F145. Normal early history. Started school in 1943 and got on well there ; did not present any problems. 1945 : a rocket fell near their house. After that the mother noticed that the child stopped playing in the street ; she also began wetting the bed again. Then the mother heard from the school that since about that time Pat had stopped talking at school and appeared completely detached, so that any contact with her became impossible. The picture developed into a typical schizophrenic one. She is still in treatment, as she has formed a rather good relationship with her doctor by the means of drawing (she never talks), and it is hoped that he will succeed in pulling her out of her withdrawal.

We have re-examined most of the schizophrenic children who attended the Clinic since 1942—14 besides the two mentioned above—but none of them shows any connection between onset and war incidents.

Before closing this chapter about the children affected and their reactions we have to mention the fact that 60·8 per cent. were boys, about the same proportion between boys and girls we generally find amongst the patients of a Child Guidance Clinic. We could not find any striking difference in the form of reaction between the two sexes, nor has one sex shown a predominance of reactions to one special war experience.

Before drawing the conclusions of the qualitative study of the case-material, we are including in the following chapter a statistical analysis of the cleared and persisting cases to which we have already referred in the previous chapters.

The statistical treatment and evaluation of the material has been done by Mrs. J. Williams, M.A., A.B.Ps.S., and K. Batcheldoor, B.Sc., who also drew up the text.

III. STATISTICS.

*Statistical Treatment.*I. *Quantitative Assessment of Data.*

In assessing the children we require to distinguish—

(1) Children whose symptoms have entirely persisted from children whose symptoms have cleared, which groups will hereafter be called "persisting" (59 cases) and "cleared" (38 cases).

(2) Children who were nervous before the war from children who were not.

(3) Children who had a nervous parent from children who did not have a nervous parent.

(4) Children who had one combination of war experiences from children who had another combination of war experiences. For this purpose the damaging experiences were classified into three types: evacuation, bombing, changes in family life.

This replaces the one general distinction by three specific distinctions.

We now have the children divided into:

Persisting ;

Cleared ;

and require to assess them for—

A. Nervousness before the war.

B. Nervousness of a parent.

C. Evacuation.

D. Bombing.

E. Changes in family life.

At this point a 5-point scale was worked out for each of A, B, C, D and E, and in a pilot research twenty children (ten persisting and ten cleared) were tentatively rated on these scales. On examining the frequency distributions it was found that they were all strongly positively skewed, i.e. the larger frequencies occurring in the lower scores. In view of this skewness, which renders the application of techniques depending on "normal theory" invalid, and also because such ratings are inevitably prone to subjective errors, it was thought that more useful and objective assessments could be made on the all-or-none principle. Accordingly, the following definitions were decided upon:

A. Child who was always nervous, or had one lasting nervous symptom or shorter spells of several symptoms.

Not A. Child who had no nervous signs.

B. Child whose parent was nervous since the war, or always nervous, or who had a definite nervous breakdown.

Not B. Child whose parent was not nervous except perhaps for occasional "nerves." (It is to be noted here that "parent" stands in 75 per cent. for "mother.")

C. Child who was evacuated without his mother, or with his mother but unsuccessfully.

Not c. Child who was never evacuated without his mother, or who was evacuated with his mother but successfully.

D. Child who experienced a near hit, or damage, or dreadful scenes, or injuries.

Not D. Child who did not experience bombing any closer than "in the district."

E. Father called up and mother out to work, or father missing or dead, or major difficulties on return of father, or broken home.

Not E. No changes in family life of sort E.

Each of the 97 children were assessed on each of the five characteristics according to the above scheme. Tables of the frequencies were then prepared as follows: First the presence of single characteristics; second the presence of two characteristics; third the presence of three characteristics; fourth the presence of four characteristics; and fifth the presence of all five characteristics. See Tables 1, 2, 3, 4 and 5. "A" implies *at least* A, "AB" implies at least "AB." Thus a number of children entered as A will also possess the characteristic B or C. Entry as AB merely implies the presence of A with B, irrespective of the presence of any of C, D or E.

It will be observed that some marginal totals exceed the number of children.

(2) *Treatment of Quantitative Data.*

The figures in Tables 3, 4 and 5 were considered too small to form the basis of any generalizations, and so were not further analysed. The Tables 1 and 2 tell us little as they stand, for although the "persisting" frequencies are higher than the "cleared," they are based on a larger number of cases. In order to see more clearly where the differences lay between the persisting and cleared samples, the actual frequencies were replaced by percentages; see Tables 1a and 2a.

Certain facts now stand out which serve as a guide in finding the most useful points at which to apply more refined tests.

In Table 1a.

(i) There seems to be a marked association between the single characteristic c (evacuation) and persistency.

(ii) There appears to be a slight degree of association between the single characteristics A, D and persistency (A, nervous child; D, bombing).

(iii) There appears to be no association between the single characteristics B, E and persistency (B, nervous parent; E, change in family).

(iv) On the average there appears to be a slight positive association between the single characteristics and persistency.

In Table 2a.

(i) There appears to be a marked association between the double characteristic BD (nervous parent and bombing) and persistency.

(ii) There appears to be a fairly marked association between the double characteristic AC (nervous child and evacuation) and persistency.

(iii) There may be an association with persistency of CD, BC and CE in that order.

(iv) It is doubtful whether any of the double characteristics DE, AD, AE, BE or AB are significantly associated with persistency.

(v) On the average there appears to be a slight positive association between the double characteristics and persistency (7.82 per cent. of cases).

Before deciding on which points it is safe to generalize two tests were applied.

(1) A test of independence.

The χ^2 test gives the probability of the observed differences being due to fluctuations of sampling.

(2) A test of the degree of association.

In those cases where χ^2 is significant, i.e. where it is reasonable to assume that an association exists, tetrachoric γ applied to this data provides a measure of the extent of the association. It must, however, only serve as a rough guide owing to the assumptions involved in its application. In the absence of Thurstone's Computing Diagrams γ may be closely approximated by—

$$\gamma\phi = \frac{\phi}{K}$$

where

$$\phi = \sqrt{\frac{\chi^2}{N}}$$

N being the sample size, and K is a constant depending on the ratio of the largest marginal total to the sample size.*

(3) *Results of Statistical Treatment.*

Only two significant values of χ^2 were obtained :

(1) For the association between evacuation and persistency. Significant at the 2 per cent. level.

Estimate of tetrachoric $\gamma = 0.41$.

(2) For the association for the double characteristic nervous parent, bombing and persistency. Significant at the 2 per cent. level.

Estimate of tetrachoric $\gamma = 0.41$.

For the association between the other single characteristics and persistency the probability of the obtained values of χ^2 being due to chance was at least 30 per cent., that of nervousness before being this value.

For the association between the other double characteristics and persistency the probability was at least 10 per cent. that of nervousness before evacuation being this value.

(4) *Conclusions.*

It can be stated with some confidence that evacuation is associated with persistency of neurosis within the limits of the definitions. The figures also lend some slight colour to the theory that nervousness before being evacuated

* A table of K , together with the particular assumptions its use involves (which appear to be satisfied in the present case) is given in Camp, B. H., *The Mathematical Part of Elementary Statistics*. Boston : Heath, 1931, p. 309.

is an additional factor, but larger numbers of cases would be needed to show whether this was statistically significant.

It can be stated also with some confidence that a combination of nervous parent (mainly the mother) and bombing is associated with persistency of neurosis.

The fact of being nervous before, or having a nervous parent is not revealed in this analysis as being of major importance with respect to persistency of war neurosis.

(4) *Summary and Conclusions.*

Two hundred and twelve children, about 16 per cent. of the patients seen by psychiatrists at the Child Guidance Clinic of the Hospital for Sick Children, Great Ormond Street, London, showed disturbances caused or aggravated by war experiences. (Patients seen between 1942-1946.)

The closer study and follow-up of these cases has revealed that—

Bombing and changes in the family life have been responsible for a greater number of disturbances, but that these have proved a tendency to clear once the disturbing factor was removed. In the persisting cases complicating factors are mostly found.

If a child had a neurotic mother, we found that his chances of reacting neurotically to bombing incidents were increased, and that such disturbances showed a tendency to persist. Evacuation after a bombing shock, untreated before evacuation, also proved to have an aggravating effect.

Evacuation, although causing less disturbances in number, has created deeper and more persisting neuroses. Children evacuated when under 5 years old suffered the most severe damage, followed by children who were nervous before evacuation.

Children who were previously nervous seem to have been more easily affected by either of the damaging factors, but a significant influence on the persistence of the symptoms could not be proved. In this connection it has been pointed out that children who appeared outwardly normal may have been at a stage of emotional crisis at the time of the war experience—a fact which, far more than the actual experience, may have influenced their neurotic reaction. Only a deeper investigation into the emotional life of the child at the time of the damage would reveal the true situation. As this was not always possible, generalizations were apt to be misleading.

The most frequent symptom was change in behaviour, followed by anxiety and fears which show the highest percentage after bombing. Psychosomatic reactions appeared about equally often after either of the experiences. The delinquencies found consisted mostly of small thefts; they all appeared after evacuation and appeared to be related to feelings of rejection.

ACKNOWLEDGMENTS.

I wish to express my grateful acknowledgments to the Medical Research Council for their grant which made this investigation possible; to Prof. Alan Moncrieff, Director of the Institute of Child Health, for his kind help and consent

to carry out the research ; to Dr. Mildred Creak, Director of the Child Guidance Clinic, for her most generous help, advice and encouragement ; to Mrs. J. Williams, M.A., Educational Psychologist of the Child Guidance Clinic, for her valuable help with the statistics, and to all the staff of the Clinic for their kind co-operation.

STATISTICAL TABLES.

TABLE I.

	A.	B.	C.	D.	E.	Total.
Persisting	36	26	40	19	18	139
Cleared	20	17	16	10	12	75
Total	56	43	56	29	30	214

TABLE 2.

	AB.	AC.	AD.	AE.	BC.	BD.	BE.	CD.	CE.	DE.	Total.
Persisting	15	23	8	11	17	14	9	13	13	7	130
Cleared	10	9	4	6	7	2	5	4	5	2	54
Total	25	32	12	17	24	16	14	17	18	9	184

TABLE 3.

	A B. C.	A B. D.	A B. E.	A C. D.	A C. E.	A D. E.	B C. D.	B C. E.	C D. E.	B D. E.	Total.
Persisting	10	6	4	5	8	3	9	6	4	6	61
Cleared	4	1	3	3	3	1	1	1	2	0	19
Total	14	7	7	8	11	4	10	7	6	6	80

TABLE 4.

	A B. C D.	A B. C E.	A B. D E.	A C. D E.	B C. D E.	Total.
Persisting	4	3	2	0	4	13
Cleared	1	1	0	1	0	3
Total	5	4	2	1	4	16

TABLE 5.

	A, B, C, D, E.	None.
Persisting	2	2
Cleared	0	1
Total	2	3

TABLE 1a.

	A.	B.	C.	D.	E.	Average.
Persisting	61.02	44.07	67.8	32.2	30.51	47.12
% of 59						
Cleared	52.63	44.74	42.11	26.32	31.58	39.48
% of 38						
Average	56.83	44.41	54.96	29.26	31.05	43.3
Difference	8.39	-6.7	25.69	5.88	-1.07	7.64
% P-% C						

TABLE 2a.

	AB.	AC.	AD.	AE.	BC.	BD.	BE.	CD.	CE.	DE.	Average
Persisting . . .	25.42	38.98	13.56	18.64	28.81	23.73	15.25	22.03	22.03	11.86	22.03
% of 59											
Cleared . . .	26.32	23.68	10.53	15.79	18.42	5.26	13.16	10.53	13.16	5.26	14.21
% of 38											
Average . . .	25.87	31.33	12.05	17.22	23.62	14.53	14.21	16.28	17.6	8.56	18.12
Difference . . .	— .9	15.3	3.03	2.85	10.39	18.47	2.09	11.5	8.87	6.6	7.82
% P—% C											

CONTINGENCY TABLES.

From Data in Table 1.

	C.	Not C.	Total.		
Persisting . . .	40	19	59	$\chi^2_1 = 6.252$	$P(\chi^2_1 \geq 6.252) < .02.$
Cleared . . .	16	22	38	$\phi = .254.$	significant.
Total . . .	56	41	97	$\gamma_0 = .4.$	

	A.	Not A.	Total.		
Persisting . . .	36	23	59	$\chi^2_1 = .666$	$P(\chi^2_1 \geq .666) > .3$
Cleared . . .	20	18	38	$\phi = .083$	not significant.
Total . . .	56	41	97	$\gamma_0 = .13$	

	D.	Not D.	Total.		
Persisting . . .	19	40	59	$\chi^2_1 = .382$	$P(\chi^2_1 \geq .382) > .5$
Cleared . . .	10	28	38	$\phi = .063$	not significant.
Total . . .	29	68	97	$\gamma_0 = .1$	

	A.	B.	C.	D.	E.	Total.		
Persisting . . .	36	26	40	19	18	139	$\chi^2_4 = 1.753$	
Cleared . . .	20	17	16	10	12	75	$P(\chi^2_4 \geq 1.753) > .7$	
Total . . .	56	43	56	29	30	214	not significant.	

From Data in Table 2.

	B.D.	Not B.D.	Total.		
Persisting . . .	14	45	59	$\chi^2_1 = 5.722$	$P(\chi^2_1 \geq 5.722) < .02.$
Cleared . . .	2	36	38	$\phi = .243$	significant.
Total . . .	16	81	97	$\gamma_0 = .41$	

	A.C.	Not A.C.	Total.		
Persisting . . .	23	36	59	$\chi^2_1 = 2.447$	$P(\chi^2_1 \geq 2.447) > .1$
Cleared . . .	9	29	38		not significant.
Total . . .	32	65	97		

BIBLIOGRAPHY.

- ALCOCK, A. T. (1941), "War Strain in Children," *Brit. Med. J.*
 BENDER, L., and FRESCH, J. (1942), "Children's Reaction to War," *Am. J. Orthopsychiat.*
 BENDER, L., and BOAS, F. (1941), "Young Children and War," *ibid.*
 BODMAN, F. (1941), "War Conditions and the Mental Health of the Child," *Brit. Med. J.*
 BURBURY, W. M. (1941), "Effects of Evacuation and Air-raids on City Children," *ibid.*
 BURT, C. (1940), "Emotional Problems of Evacuation," *Brit. J. Educ. Psychol.*
 CAMERON, H. C. (1940), "Evacuation," *Proc. Roy. Soc. Med.*

- Cambridge Evacuation Survey*, ed. by Susan Isaacs. Methuen & Co. Ltd., London, 1941.
- DEBRÉ, R. (1945), "Conditions of Children in France under the Occupation," *Proc. Roy. Soc. Med.*
- ELLIS, R. W. B. (1945), "Child Health in Belgium during and after the Occupation," *ibid.*
- FRANÇOIS, CH. (1948), "État psychologique des enfants à leur arrivée au Renouveau," *Zeitschr. f. Kinderpsychiatrie*.
- FREUD, A., and BURLINGHAM, D. (1942), *Young Children in War-time*. London: G. Allen & Unwin, Ltd.
- Idem* (1943), *War and Children*. Int. University Press.
- GEbbie, N. (1942), "Reports on Effects of Air-raids on Children," *Brit. Med. J.*
- GILLESPIE, R. D. (1942), *Psychological Effects of War on Citizen and Soldier*. New York: W. W. Norton Co.
- HART DE RUYTER (1947), "Massenpsychologische und psychopathologische Erscheinungen beim Kinde und Jugendlichen während der Kriege und in der Nachkriegszeit," *Zeitschr. f. Kinderpsychiatrie*.
- HENSHAW, E. N., and HOWARTH, H. E. (1941), "Observed Effects of War-time Conditions on Children," *Mental Health*.
- HICKLIN, M. (1946), *War-Damaged Children: Some Aspects of Recovery*. London: A. P. S. W.
- JOHN, E. M. (1941), "A Study of the Effects of Evacuation and Air-Raids on Children of Pre-School Age," *Brit. J. Educ. Psychol.*
- KIMBER, J. J. T., and ALCOCK, A. T. (1941), "War Strain in Children," *Lancet*.
- KOEKEBAKKER, J. (1945), *Onze Kinderbescherming in Oorlog en Vrede*. Purmerend.
- MEIERHOFER, M., "Ueber die Kinderauswahl und Medizinisch-Psychologischen Erfahrungen im Kinderdorf Pestalozzi, Trogen." Report to U.N.E.S.C.O. Conference, Trogen, 1948. Unpublished.
- MONS, W. E. R. (1941), "Air-Raids and the Child," *Brit. Med. J.*
- ODLUM, D. (1947), "Some Observations on Reactions of Children to War-time Conditions as seen in a C.G.C.," *Zeitschr. f. Kinderpsychiatrie*.
- Oxford Evacuation Survey: London Children in War-time Oxford* Oxford Univ. Press. (1947).
- PFISTER, M. (1948), *Erfahrungen bei Kriegsgeschädigten Flüchtlingen und Rückwanderern*. Gesundheit und Wohlfahrt, Heft 2.
- PRITCHARD, R., and ROSENZWEIG, S. (1942), "The Effects of War Stress upon Childhood and Youth," *J. Abnormal and Social Psychol.*
- SCHILDER, P., and WECHSLER, D. (1945), "Attitudes of Children towards Death," *J. Gen. Psychol.*
- SHIRLEY, M. (1942), "Children's Adjustment to a Strange Situation," *J. Abnormal and Social Psychol.*
- VERNON, P. E. (1941), "Psychological Effects of Air-Raids," *ibid.*
- Mental Health* (1942), "On Children and the War."

A PSYCHIATRIC IN-PATIENT DEPARTMENT FOR CHILDREN.*

By KENNETH CAMERON, M.B., M.R.C.P., D.Psych.Edin.

Physician, Bethlem Royal and Maudsley Hospital; Lecturer, Institute of Psychiatry.

THE Children's In-patient Department of the Maudsley Hospital has now been running for two years, and currently accommodates twenty to twenty-five in-patients of both sexes. These range through severe organic disabilities, early cases of delinquency or behaviour disturbances and emotional or psycho-neurotic problems. In the under fives there are a high proportion of acute disturbances of behaviour and habits. It is believed that our experience in developing this unit and discussion of our problems solved and still to be met will prove of value to other hospitals planning similar accommodation.

ACCOMMODATION.

The department as presently established consists of a first floor T-shaped unit. Each arm of the T represents sleeping wards, male and female, each with two side-rooms, bathroom accommodation, etc. At the confluence of these arms is the main playroom; glass partitions allow both wards to be commanded from the playroom. At the proximate end of the leg of the T is a small vestibule communicating with the wards, stairs and kitchenette. From this vestibule also extends the leg of the T, a large concrete-floored covered playground opening beyond into a high-walled open air playground.

On the ground floor is a six-bedded sick ward with two isolation cubicles, bathroom and lavatory accommodation, a large dining room and kitchen. Outside we have a small triangle with trees, sand pit, paddling pool, and a larger playground. The hospital is adjacent to two public parks, which have proved of the greatest value.

CRITERIA FOR ADMISSION.

Cases are admitted up to the age of twelve for each sex. Our youngest case has been aged three years. Tentative efforts to increase the age range at the upper end have had to be abandoned. The most striking result of admitting boys advanced in puberty was a general preoccupation with sexuality which permeated through the younger age-groups. At first it seemed possible to admit older girls, on the principle that an older girl would more readily mix with younger children, but it was found that these older girls tended to remain isolated, neither mixing with children nor identifying with nursing staff. While the pressure for admission is mainly for disturbed boys, we have found that when the number of boys has materially exceeded that of girls, the ward has

* Paper delivered to the Child Psychiatry Section of the Royal Medico-Psychological Association on 23 February, 1949.

been more disturbed. With the age range indicated it has been found that the ward population is best divided into three main groups. The first is around six and seven, and includes both sexes. Then a group of boys around ten forms one group. The older girls form a less definite group—the more active joining the boys. In addition, more severely disturbed or psychotic children form stragglers—who stretch the attention of the nursing staff.

Cases are admitted from the out-patient list for observation and investigation ; or when so acutely disturbed or disturbing as to necessitate hospitalization for treatment ; or when intensive treatment requires the more concentrated effort possible in the planned environment of hospital. We do not consider it our function to retain in hospital cases in whom active investigation or treatment is not taking place, or who are not the subjects of a research programme.

STAFFING.

The demands of staff for such a mixed group who continually change are heavy. This need for staff also depends on the fact that children admitted are so acutely disturbed and so varied that the organization and outlook must be basically that of a hospital ward. Nevertheless, the fact that all the children are up and active means that they must be continually engaged and occupied. It early became apparent that children actively engaged with an adult constitute an amenable group, however much disturbed, while children left to occupy themselves, or bored children, form an explosive mixture, however normal. In addition to the nursing group, one is, therefore, very dependent on the occupation therapy department, a carpentry unit, the P.T. instructor, and as much adventitious voluntary aid as can be attained. One of the psychiatric social workers of the hospital who runs a percussion band and a dancing class makes an invaluable contribution. An enlightened and progressive tutor from a nearby nursery teachers' training college, who brought in a small group of students once a week to work with the disturbed children, contributed a freshness of outlook and interest which was as valuable to the unit as the experience proved to the students. The changing organization of the hospital with the National Health Act has delayed the appointment of a teacher, but with a smaller group and a sister with teaching experience, it was early found that most of the children educationally handicapped by their problems were most receptive to formal, if very individual, teaching.

The plan of development was to admit at first a very small number of children and build up our organization with increasing experience. It will be of value perhaps to give approximate numbers of staff for an intermediate phase which we have now passed : With ten children of from three to twelve years, and a three-shift system of nursing, three nurses are required for each day shift, and two night staff—or one able to call on a relief during the early hours of the night, or at reveille. In addition, the ward sister should overlap both shifts during the day. An increase of children beyond these numbers can be met by an additional staff nurse, and then by additions to each day shift. Such an organization supposes occupation, physical activity, special coaching, etc., to be available for an hour or so each day, but leaves the maintenance of these

activities to the nursing staff. And, from the point of view of nursing strength it is to be borne in mind that it must always be assessed at its weakest. It is of little value to have the children ideally handled from ten to twelve, or two to four, if at meal hours, bathing time or bed time a disgruntled and bored group of children, detached from adult interest and attention, develop a mob spirit. Adult patients neglected generally become bored and apathetic, children excited and destructive.

Proceeding as we are to double the numbers instanced, it is clear that we must plan our organization to cover a nursing routine and an activity routine, and it is hoped that the appointment of a full time occupation therapist and a teacher will allow this increase without a proportionate extravagance in nursing staff.

As will be generally appreciated, the organization is of little value if the personalities of the staff are not suited to the children. The Ward Sister is of paramount importance. She is faced with the need to be equable but energetic, intuitive but authoritative, sympathetic but an administrator. Faced with the need of such a paragon, we have found with relief that the wards have been admirably run in succession by a sister whose pre-occupation with the children's need for affection allowed authority to be vested in the doctor, but called it in seldom; by a sister whose appreciation of the children's need for imaginative, intellectual and emotional outlet was balanced by a capacity for authority and warmth; and by a sister whose capacity for administration formed a stable routine, but whose sympathy with the individuals' needs resulted in the other qualities being added to her. In short, it is a relief to find that a sister of intelligence, provided she has sympathy with children, will inevitably have the other qualities developed by their demands.

The nursing staff has been drawn from those undergoing training in the adult psychiatric wards. It cannot be too strongly emphasized that preliminary experience in the care of psychiatrically ill adults, so far from being a handicap, is an overwhelming advantage in those having care of children. Nurses come on the ward wholly lacking the rigidly moral attitude that sees a disturbance in terms of "good" or "bad" behaviour. In addition, we found that it was necessary that the nurses should like children and should be intelligent and energetic. The plump, placid, motherly but rather stupid nurse whom we initially welcomed proved more acceptable to our fantasies than in reality. Children of the age-group dealt with appear to have little use for conventional mother figures, and promptly "make rings round" a nurse lacking imagination or intelligence. From the beginning it became clear that male staff were almost essential. Boys above seven or eight need male figures, and a male nurse can be equably in command of a situation where tact and persuasion have failed. It goes without saying that sympathy with children, insight and intelligence are equally essential in male staff.

In educating the nursing staff to work with children, four basic principles were given them. They were impressed with the biological need for a child to have affection, and the disturbances of the patient were first emphasized to them in so far as they represented deprivation of affection, symptoms that repel unenlightened affection, or anomalies that prevented the child accepting

or responding to affection. It was made a general principle that an admission must be met with uncritical warmth till he was assessed and it was clear how much need be expected from him. Secondly, the principle was propounded that the infant abandons immediate gratification to retain the approval of the mother who gives it affection; the aim that we should produce conformity to reasonable demands was based on this principle. With individual cases it was made clear that the degree of conformity to be expected must depend on the clinical state or stage of the child. For example, the negativistic, over-restricted, aggressive child must be given full tolerance till he had become dependent and showed his need for affection, when he would desire to meet the wishes of the staff. The depressed and inhibited child readily focused nursing care on himself, but it was necessary to remind the staff of his inner insecurity when he became a rowdy, mischievous little imp. The third and most difficult principle to convey was the child's need for emotional outlet, imaginative and creative activity and physical activity. As far as possible it has been the aim to provide for emotional support through daily contact with the child's own doctor and by allocating each child to a particular nurse, who should be responsible for that child's nursing notes and take a special interest in him. Particularly "necessitous" children were attached, or rather attached themselves, to the Sister, and we became reconciled to the impossibility of ever approaching the Sister without taking care to avoid treading on the current case of emotional malnutrition. For imaginative and creative outlet we found contact between the nursing staff and the occupational therapy sections and progressive members of the teaching profession was essential. Appreciation of this need is only exceptionally endogenous to the nursing group. Physical activity was provided by the recurrent supply of footballs, etc., by a swing, trees, old car tyres, etc., in the play triangle, or by daily outings to the nearby parks whenever weather permitted. The writer must pay respect to the general readiness of nurses to take quite severely disturbed children into the normal community, with great benefit and without untoward incident over two years.

Finally, the question of the use of authority and a stable routine became increasingly necessary as numbers increased. The necessity of the first three principles was reiterated as the basis for control, but nurses were gradually encouraged to assert authority if the circumstances justified. The first solution offered if a child were disturbed or uncontrolled, or aggressive to a degree that could not be tolerated, was to use persuasion or alternative interest. If these methods failed the child was temporarily taken out of the group—if necessary carried. At first we seemed always to be carrying away struggling children, but as the staff became more secure, the need ceased to arise except in very exceptional cases. We have never avoided admitting or hastened the discharge of a child because of disturbed behaviour.

The final point to be emphasized is the continual need for the nursing staff to feel secure. The above four basic principles were emphasized continually. Weekly ward talks were given in which either the individual case or a general ward principle or difficulty was discussed. Apart from this, continued efforts were made to encourage the individual nurses. The Ward Sister found it expedient from time to time to advise a new nurse to cease to think of theo-

retical principles and deal with a child according to her own good sense and knowledge of children, and postpone theory till it emerged from individual problems. It was necessary for the nurses to feel that a doctor entering the ward did not do so with a critical eye directed to the performance of the nurse. The four main principles outlined above were embodied in typescript and given to each nurse on coming to the ward. Additional points were added as they emerged. For example, it became clear that an adult could not "supervise" the children. He must work with the children. The need for "working with" the children became abundantly clear. A group of children, of whom some were disturbed, left to themselves developed a mounting tension comparable to the voltage of a set of electrical cells in series. With adults intermixed and working with the children the link-up appears to be "in parallel" with the adult and the child.

With the best will, and particularly before ward morale was secure, there developed from time to time eruptions of complete unruliness. We found this always emanated from one, or possibly two, children. The solution to such a situation is to remove the disturbing centre of the disturbance and discuss the issue with him privately. Without him the rest of the group already anxious at being emotionally in insurrection relapsed relievedly into approved activity.

MEDICAL ORGANIZATION.

The in-patients were organized under an in-patient registrar, who was responsible for day-to-day problems in ward routine and immediate problems of physical health. He represented immediate medical authority. The responsibility for individual treatment was divided among the psychiatrists working in the department under the supervision of the seniors. The dichotomy between the therapist and the authority in the ward was found valuable in respect of emotional problems or conduct disorders where the therapist might be gratified by his patient displaying unwonted aggressiveness, while the ward registrar was intent on canalizing or curbing undue unruliness or limiting the same patient's bullying of little ones. The writer, part of whose responsibility is the clinical organization and administration of the department, initially planned to be a final benevolent figure in the lives of the children, capable of intervening in difficult situations. The children decided otherwise, and he found himself created a bogey of imponderable power.

INVESTIGATION AND TREATMENT.

On admission parents were asked to complete a list of all the infectious illnesses from which the child had suffered, and previous inoculations. This information proved invaluable in the recurrent outbreaks of infection.

Complete physical investigation was made in all cases; with normal clinical examination, referral to specialist paediatric departments, and appropriate special investigations in the shape of EEG, etc. Admission of itself proved a valuable diagnostic procedure in disturbance of habits of eating, elimination and behaviour problems where the main causative factors were environmental,

and often produced a reformulation of the problem and the placing of emphasis in the proper quarter. Psychological investigation has become increasingly complete, and is a function of the Psychological Department of the Institute. It is now extended to include routine groups of tests of intelligence, with tests of practical ability if indicated. We are increasingly impressed with the need for retesting after treatment, and before a final assessment is made of the patient's potentialities. Further projection tests—Rorschach and Thematic Apperception—are being made available in the case of older children, and the use of simpler story completion tests, etc., is being explored in the case of younger children.

Where educational problems are present, and in quite a number of cases where they are not apparent, standard tests of reading and arithmetic age are extremely valuable. We are too apt to assume that innate intelligence and educational attainment are proportionate, which is emphatically not the case. Experience suggests, too, that educational retardation is even more traumatic to the child of average or superior intelligence than to the intellectually backward.

A social case-history is a routine part of the examination of every child who is seen in the department. We are fortunate in the recent appointment of a psychiatric social worker full time to the in-patient section. This means the amplification of work in this respect in the case of the in-patients.

TREATMENT.

Nowhere so much as in the therapeutic approach is appreciation of the essential socio-psychobiological unity of the child more essential.

The total investigation should clarify (if it can) genetic factors, constitutional elements, initial endowment and organic factors, explore environmental and developmental influences, and define the individual reaction of the child. This done, the need for treatment completely alters the focus. Efforts must be directed towards modifying the factors susceptible to alteration, and these may not be those primarily responsible for the condition. Nevertheless, experience abundantly shows that by diminishing stresses which can be altered, we allow the child to achieve relative normality in spite of unalterable handicaps. Thus, a boy of ten, showing the neurological evidence of severe head injury, was admitted from an observation ward as a result of uncontrolled behaviour. Environmental and psychotherapeutic treatment in hospital with educational coaching eventually achieved an apparently normal child. Parallel exploration at home revealed a mother severely disturbed, who taxed the psychiatric social worker's skill. Eventually a boarding school allowed the boy to lead a normal life, while the efforts of the psychiatric social worker achieved a home to which he could return with satisfaction on holiday. An epileptic may have his fits controlled by drugs, but be incapable of leading a normal life till his obsessional system has responded to therapy, or of returning home till the mother has received help and the treatment that will prevent her recreating the problem. In every case the need for total treatment becomes apparent.

Finally it should be emphasized that with children hospitalization is but a phase of treatment, and should lead often to increased concentration on the mother at home or the future environment. Circumstances often compel this, as the admission of a disturbed child may sometimes precipitate a psychotic illness in the mother. Much work has also to be done with discharged cases if the benefit made by the in-patient treatment is not to be lost.

A number of cases of infantile dementias have been admitted for study and observation. The post-encephalitics and epileptic deterioration can be defined, but the residual cases of schizophrenic development require closer study. Physical methods of treatment are being tentatively explored with the severely disturbed and totally inaccessible of these. Another case of schizophrenic withdrawal receives intensive daily treatment with a projective method on an analytic basis.

Electrophysiological investigation has revealed the presence of epileptic phenomena in cases where it was not anticipated. The ward also allows more overt cases of epilepsy to receive careful observation while being stabilized on the more elegant variations of a pharmacological regime before being returned to out-patient clinic or practitioner. Behaviour disturbance related to specific disturbances of the EEG also form the basis of a long-term investigation.

The psychologists play their part in the educational aspects of treatment. Special coaching is available for general educational retardation of specific disability. With the co-operation of the London County Council, coaching vacancies are available in their classes for children retarded through emotional causes, and these children attend from hospital. We also make a practice frequently of returning children to full attendance at day school some weeks before discharge from hospital. This has proved most valuable. The psychologist concerned usually maintains contact with the school or special class.

In emotional or developmental problems, whether manifest in disturbance of habits or behaviour, the usual child guidance techniques are employed. Group phenomena can sometimes be utilized in children's spontaneous ward association, and invaluable observations made. We tend to use painting as a projective and therapeutic method. Initially some fears were entertained that the frequent use of painting, drawing and play as a creative or recreational outlet would impair subsequently the value of these techniques in a therapeutic relationship. This has, in fact, not occurred, and the specificity of the relationship in therapy is re-emphasized.

Finally, one must reiterate the importance of every aspect of a psychiatric social worker's function in an in-patient department. In every case she mediates and explains the hospital to the parents, in selected mothers she embarks on case work, and in many instances she maintains the contacts with social agents, and organizes the environmental modification that will be necessary on the discharge of the child if the effect of admission is not to be lost.

SUMMARY.

The children's in-patient department at the Maudsley Hospital is described. Organization and staffing is outlined. Principles of investigation and treatment are discussed.

THE INTERPRETATION OF SOME DISORDERS OF SPEECH.

By W. W. ROBERTS, M.R.C.S., L.R.C.P., D.P.M.

(From the Department of Clinical Research, Crichton Royal, Dumfries.)

[Received 25 April, 1949.]

THESE notes are divided into three sections. In the first, consideration is given to cases of aphasia occurring in childhood. In addition, the handedness of defectives is touched on, and there is a note on the influence of heredity. The section as a whole owes its existence to ideas set in motion by Brain's "Speech and Handedness" (*Lancet*, 2, 839, 1945). For that reason somewhat disparate elements are dealt with together. Section two is concerned with stammering; an endeavour is made to apply to this condition propositions put forward in the first section. Brief attention is given to bad spelling—or rather to that group of bad spellers in whom there is consistent discrepancy between their intellectual capacity and attainments, and their performance in oral and written spelling. The last section deals with "motor" or executive aphasia. A plea is put forward for the recognition of a dysarthric component in this condition. An anatomical configuration is suggested by which unilateral cortical dysarthria would become a possibility.

HEREDITY, DEFECT AND EARLY APHASIA.

After criticizing the view that man first became right-handed and then developed speech, Brain (1945) writes: "Is it not, on the other hand, more probable that it was the appearance of a motor speech "centre" in the left hemisphere in man that made that the dominant hemisphere, and the right hand the dominant hand, in contrast to the ape, in which right and left-handedness develop with equal frequency?" If the evolutionary primacy of the motor speech-centre is accepted, it is reasonable to regard the centre as maintaining its lead in the development of the individual. One may logically suppose that recapitulation takes place, that the speech-area first finds form and expression, and that the side of dominance and the direction of handedness are thereby determined. It is not improbable that the infant passes through an earlier, fleeting, simian phase in the same process of growth by recapitulation. In this phase, rudimentary random handedness may be detected. But true human handedness occurs after the beginnings of speech, by which it is directed and to which it is linked. In the great majority of cases such handedness persists throughout life. Its essential quality is its determination by speech. Speech and handedness are linked characters, and the relationship of the former to the latter is causal, temporal and directional. Whenever possible, the link is preserved in subsequent translocation of the speech-nodes or in subsequent deviation from native handedness. The former event is succeeded

by change of handedness. The latter event is preceded by transfer of the speech-nodes. The conjoined functions tend to alter as a whole. The proposition is applied, in this and the succeeding section, to some cases of early disorder of speech and handedness, after a preliminary comment on the influence of heredity.

Brain (*ibid.*) cites heredity as the most important cause of handedness. "The inheritance of right-handedness as a dominant and left-handedness as a recessive will explain most of the facts." He writes later: "Thus we are left with the question why the left hemisphere is commonly the major one. The genetic explanation of this is that left hemisphere dominance is dominant also in the mendelian sense, whereas dominance of the right half of the brain is usually inherited as a recessive." But speech—as stated above—is considered to take the lead in individual as well as in evolutionary development, and to stand in causal relationship both to handedness and to dominance. Therefore, only one inheritance is required for both of these. The position of the speech-nodes alone requires to be transmitted. Left-sided speech is dominant; right-handedness and left cerebral majority are its invariable accompaniments. The appearance of heritable value is given to characteristics which in truth are acquired or accessory. This results from their strict dependence upon the primary character of speech-location. If this argument is sound, the explanation of the rare cases of homolaterality of speech and handedness—"perhaps because speech and handedness have become dissociated in inheritance"—cannot be sustained.

Gordon (1920-21), in a study of defective school children and of twins, found that the percentage of left-handed individuals was conspicuously higher among defectives than among normal children. He took the view that the left-handedness was the result of a left cerebral lesion also causing defect. Such an explanation does not cover the total range of defect, though high left-handedness or ambidexterity runs through the whole; indeed, Gordon's theory is expressly limited to his group of educable defectives. Many defectives in the lower grades are speechless. The influence of the speech-centres on handedness is cancelled, and with it the hereditary factor in the determination of handedness. These defectives are to be regarded as reverting to, or failing to emerge above, the simian level. At that level handedness is distributed equally between left and right, given a sufficiently large sample. Speechless defectives will show a similar distribution. Also, their handedness, without the purpose conveyed through the link to developing speech, will be an inefficient function. Gordon's group possessed the power of speech, though in many cases speech was defective. Many of the left-handed individuals in the group are stated to have become so because of weakness or clumsiness of the right hand, though this factor was not explicitly investigated. If the proposition already advanced is correct, such a cross-over of handedness must be preceded by transfer of the speech-centres to the minor hemisphere. Only thus will be preserved the temporal and directional link with speech: and this is believed to be the essential element in human handedness. That such a transfer can occur is evidenced by the early traumatic dysphasias, in whom the speech-centres are known to cross to the undamaged hemisphere. But

in the defective group, while handedness alters, defect remains. There must, therefore, be a degree of damage in each hemisphere. While crossing of the speech-centres does little or nothing to relieve defect, or even to improve speech, relative escape of the hand-centres of the minor hemisphere permits of the promotion of the left to the leading hand. Weakness or clumsiness of the right limb may be the influence determining the change. More probably, this is determined by the far more serious delay and difficulty in speech, and allied halting in intelligence. (Intelligence in the child implies the ability to become more intelligent. It is a promise of development as well as a limit of intellectual capacity.) These lead to what may be termed a search in the minor hemisphere, an expression of the teleologic drive of the organism. The search in regard to freeing of the individual's intelligence is unavailing; but a more useful leading hand is found, and dominance settles on the side of the brain controlling it. Though in many cases the escape from the major hemisphere has no influence on defect, this may not invariably be so. In some cases an undamaged minor hemisphere may be found. A certain number of individuals may indicate by their sinistrality that they have escaped from defect. A much smaller number of right-handed individuals may achieve the same result by a similar method. Gordon (*ibid.*) notes that "spontaneous change of left-handedness to right-handedness in writing among mental defectives is often found to be associated with progress in school work and in intelligence." These, in the light of the theory here put forward, are seen as native sinistrals with damaged major hemispheres. By search and escape to the less damaged minor hemisphere they advance from defect. Crossing of the speech function is thus advanced as the prime cause of the increase in left-handedness among educable defectives. It occurs especially, and perhaps only, in those who display early disorder of speech or disablement of the leading hand. It succeeds in those cases where a lesser degree, or an absence, of damage is found in the minor hemisphere. This provides for greater ease of speech, or gain on defect, or both. The crossing is thereby approved, and the new centres are consolidated. It succeeds also in those cases where an equally-damaged minor hemisphere is found, but in association with a more useful hand. The increase in left-handedness, expressed as a percentage of the total cases, is less than the percentage of crossing cases. The difference, expressed as a percentage of the crossing percentage, is twice the normal percentage of left-handed cases. Thus, if the latter is 5 per cent., and the crossing cases 40 per cent., the increase in left-handedness is 36 per cent. and the total left-handedness 41 per cent. In this group of cases, the "normal" incidence of left-handedness corresponds with the initial rate of 25 per cent. expected by theory, since the usual diminution of left-handedness is not allowed to develop. With the same proportion of crossing cases (40 per cent.), the difference between the increase and the crossing-rate will be 50 per cent. of the crossing-rate, and the new rate will be 45 per cent. The age of crossing varies, but is usually early. The power of crossing probably has a mathematical relationship to age.

Orton (1937), in his discussion of the congenital abnormalities of speech in children, comments on the frequency of left-handedness and ambidexterity in the personal histories of the children. He uses the concept of intergrading

and makes intergrading the determinant of failure in speech. But such "intergrading" is, properly speaking, a result and not a cause of defective development of speech. The absence of speech-nodes results in a simian level of handedness, where left and right have about equal distribution. Furthermore, the leading hand, deprived of the guidance and stimulation streaming from a rapidly-developing speech-area, cannot attain a normal superiority of use. The margin of preference over the minor hand must always be small. Also, if the idea of search in the minor hemisphere is a valid one, one must invoke it in congenital dysphasia. Does not this lead to the inevitable conclusion that the disability requires a bilateral lesion? It is of interest to note that the family trees of these patients contain many left-handed and ambidextrous individuals. Are the two facts connected? Is it reasonable to suppose that left-handedness increases the possibility of dysphasia in the descendants? Is it not more likely that there is transmitted through the family a failure to develop the *left* speech-area? That this leads to search and escape to the minor hemisphere, and hence to left-handedness? And that, in isolated cases, there is failure to develop both speech-sites, with total failure of speech and a simian distribution of handedness with a low margin of preference?

Early acquired dysphasias, of traumatic or infective etiology, differ in one important respect from those of later life. Damage to the speech-function is transitory, if the minor hemisphere is spared. The latter accommodates the paths and powers of speech formerly contained in the major hemisphere. The appearance of the new centres may be to some extent facilitated by hereditary factors. The difference between the major and the minor hemispheres in respect of the speech nodes is not the simple difference between presence and absence. It is the difference between presence (D) and presence (R). The hereditary disposition is peculiar in that dominant and recessive characters separate out in different halves of the brain. Both are states of neurological "dominance." (These statements do not apply to DD and RR individuals). Position, a localizing character, is transmitted, rather than diffusing attributes such as stature, colour or maturity. It is possible that, to use an analogy, the right brain may be a diagram of the left in regard to speech; the two halves of the brain may give contemporary meaning to the states of being and fore-being. Further, incomplete dominance may advance the status of the recessive character, that is, may promote partial development of the right speech-area. Crewe (1947) gives examples of recessive characters appearing recognizably in the heterozygote: though non-red colouring of the hair is dominant, "the heterozygote can often be recognized by a reddish tinge to the hair and by heavy freckling." Again, schizophrenia is carried by a single recessive gene, yet Kallmann (1948) states that "schizoid personality-types may be either homozygotes with effective resistance to the expression of the genotype, or heterozygotes with strongly reduced resistance." Such observations bear closely on the question of ambidexterity. Destruction or abandonment of the left speech-zone may lead to the occupation of a right speech-zone which already exists at or above the level of design. If inhibition of the right zone on behalf of the left is implicit in left dominance—is dominant—it may disappear in a destructive lesion of the left hemisphere. The age

below which the transfer of powers can be effected is variable. Brain states that "It is much less likely to happen when speech-pathways are already established in the left hemisphere." Elkington and Purdon Martin (1946) say more positively: "No lesion of the speech-region of the left hemisphere, however extensive, causes lasting loss of speech in a child under the age of 6 years, provided that sufficient intelligence remains. After this age the possibility of such compensation by the right hemisphere from (*sic*) lesions in the left hemisphere seems gradually to diminish and to occur but little after adult life is reached, but even in adult life remarkable exceptions to this rule are seen." Such statements indicate the likelihood of a mathematical relationship between age and recovery-rate in aphasia. Formidable difficulties attend the statistical testing of this possibility. The collection of recoveries from different age-groups of the same universe is involved, and their assessment as proportions of all cases of aphasia in the same groups. Nevertheless, a forecast is made that, in a population developing a statistically adequate number of cases, the proportion of recoveries would be found to produce, against age, an S-curve almost symmetrical about the mean rate. The curve is of the same nature as the normal frequency curve represented by

$$y = ae^{-\frac{x^2}{2(n+1)}} \\ = ae^{-kx^2}$$

It would indicate the probability or power of recovery at each age, and in all cases of aphasia. It would also define the limits within which the link between speech and handedness is preserved. The link—as has been said—is the all-important element in human handedness. In early years it is stable, and rides out disasters which compel a transfer of speech or handedness. But it becomes more brittle with age, and there is an increasing tendency for it to disappear in alteration of either function. Age lowers its resistance; increasing age increasingly operates against the ability of the conjoined functions to alter as one. Loss of handedness must plainly obey the same rule as aphasia. The proportions of recoveries must bear the same relation to age, and will define the same curve. In early life, lost or impaired use of the leading hand is responded to by an increase of efficiency in the previously subordinate hand. Speech-centres cross, and true handedness develops in the uninjured hand. The power of transfer diminishes as age advances. The left hand certainly comes more into play in all cases; but it increasingly fails to develop true, linked handedness, because of increasing fixity of the speech-nodes. The position may be summed up by saying that in early life the "compelled" use of the hand becomes the "preferred" use of the hand; while in later life the uninjured hand remains the "compelled" hand.

In early aphasia, Elkington and Purdon Martin limit the power of crossing to those cases where sufficient intelligence remains. Since the dementia is a direct and proportionate result of the lesion, the statement in effect limits the power of crossing to those cases where the lesion is not of the greatest severity. Or, conversely, it affirms that cases of great severity do not recover the use of

speech, though the subjects may be under six. Is this statement correct? If the conception of "search and escape" is trustworthy, it is incorrect. For the search takes place as an impulse reaching out from the goal-determined urge or drive of the organism. It must be assumed to be independent of the intellect. It must proceed, however severe the lesion and however profound the dementia. If it fails, it must fail because of equal or approximately equal damage to the minor hemisphere. Failure of recovery in the area of probability implies a bilateral lesion. This, rather than loss of intelligence, appears the probable explanation.

Alteration of handedness is to be expected in cases of aphasia which recover by transfer. The acquisition of new centres does not affect the dependence of handedness on those centres. The integrity of the link is preserved. The tendency to preserve it enables the child to trace again the evolutionary step relating the hand to the motor speech-centre. It passes again from phonation to verbalization, and again ties the hand to speech. But transfer of handedness will be opposed by two influences. In the first place the child will have memories and habits of use of the previously leading hand. In the second place the alteration will usually be from right to left. The emerging use of the left hand is likely to be checked, as it frequently is in native sinistrals. Nevertheless, one would suppose that traces of the new handedness will become established, and may be detected. For reasons subsequently given, such handedness is most likely to betray itself in gesture. Follow-up of a number of children who have recovered from post-natal dysphasia should reveal a higher than normal incidence of left-handedness or ambidexterity. If such an incidence were established, it would be important evidence tending to confirm the "rule of conjunction" put forward here. The child will, it may be supposed, display divided handedness of a kind frequently met with in stammerers. In both there is imposed dexterity. In the aphasic group, however, dexterity is enhanced by pre-aphasic custom. In the section on stammering, reasons are given for supposing that there are bilateral speech-centres which are responsible for the speech-defect. In aphasic cases there can be no such bilaterality, and therefore no stammer.

STAMMERING.

Stammering occurs frequently among individuals in whom there has been an imposed shift of handedness from the left hand. In the group of native sinistrals, three sub-groups may be formed, composed of (*a*) those in whom there is complete and successful transfer to the right hand, (*b*) those in whom there is incomplete or partial transfer, and (*c*) those in whom transfer fails or is unattempted. In sub-group (*a*) and in sub-group (*c*) there is no incidence of stammering. In sub-group (*b*) the incidence of stammering is high, and the sub-group contributes over 50 per cent. of the total number of stammerers. Among the latter, partial or masked left-handedness should always be sought. The actions most likely to betray the original handedness are gestures. In aphasia, foreign—referential—orectic language are lost in that order. Emotional speech is the kind most resistant to decay. Gesture, a form of

"speech," is a concert of movements in which the leading hand is likely to be most intimately associated with the speech-centres. Further, it is for the most part emotional speech. Even when used in referential exposition, it is used in order to impart emphasis by emotional means. In a partial shift of handedness there should, by the rule of conjunction, be a partial transfer also of speech-centres. Since emotional speech is the last language to fail in the traumatized speech-area, it is likely to be the last speech to be affected by partial transfer. In most cases, it will remain in the half of native dominance. In this position, it will continue to give a bearing to the originally leading hand, when emotional speech is aided by gesture, or referential speech emphasized by it.

Success in transfer from the left depends upon the age of transfer. Hereditary handedness may show itself early, possibly at or soon after the first attempts at self-feeding. It is usually established during the second year, and imposed transfer may therefore begin in the last months of that year. Such a transfer is likely to be complete and rapid. Its completeness, by the rule of conjunction, is dependent on prior transfer of the speech-centres; this transfer is clearly most likely to be successful when it is close in time to the beginnings of speech. Later transfers occur when there is later, less assiduous and less constant effort to impose on the child the use of the right hand. These transfers take progressively longer to effect, and are increasingly unlikely to succeed completely. Perhaps the age of three may be taken as a water-shed. Below it, asymptomatic transfer occurs. Above it, shift is partial and often accompanied by stammering. In many cases, handedness is not seriously attended to until the performance of writing, when the left-hander is forced for the first time to use his right hand in a complicated act. Stammering often begins at this time. All these cases must be regarded as primarily failures in transfer of the speech-centres. It will be noted that this failure often occurs below the age at which, in traumatic cases, transfer of centres is successful. The reason for this discrepancy is clear. An urgent compulsion to establish the organism's power to communicate by speech leads, in the latter cases, to "search and escape" from the desert-like area of the major hemisphere. In the former cases the "escape" is from perfectly-functioning centres, and no such compulsion exists. In the latter cases, governance of speech moves out of an untenable site; in the former the site is not in danger.

Stammering, then, occurs with a high degree of frequency when there is an incomplete transfer of speech-centres associated with a relatively late and partial shift of handedness. Is there a division of speech-centres, or parts of centres, between the two sides? It has already been stated that emotional speech tends to remain a function of the original major hemisphere. Further, it is obvious that most sinistrals will develop a writing-path for the right hand in the original minor hemisphere. In spite of this apparent tendency towards fragmentation of the speech function and allotment of separate fragments to separate hemispheres, it is difficult to believe that erection of new speech-centres proceeds by, or in step with, subtraction from the old. More probably in the new speech-area complete centres arise, and incomplete transfer results in bilateral representation. Different emotional or expository circumstances

may determine which set is in operation. It is possible that one side or other may achieve ascendancy, and thus become the site where an aphasigenic lesion may occur. It is possible that such ascendancy may not be directly and quantitatively related to the amount of handedness in the connected hand. Such may be the cases where faulty localization of the lesion occurs. It is also possible that bilateralization may, in some individuals, produce immunity from aphasia by a single lesion.

These are speculations, but it seems a reasonable deduction from the rule of linkage to predicate some degree of bilateral representation of the speech-function in stammerers. In stammering itself the essential happening is a sudden, total inhibition or arrest of speech which, however, is not retroactive—i.e. does not impede repetition to the point of arrest. The arrest occurs where certain consonants are placed in the line of speech. In the case of voiceless consonants, the inhibition commonly severs the link between these and their succeeding vowels but does not impair their articulation. In the case of voiced consonants, in addition to the severance of the link there is loss of vocalization, but articulation is frequently unimpaired. In association with inhibition, there are involuntary muscular contractions, on the one hand, and repetition, on the other. The muscular contractions result in intermittent spasms of the facial and respiratory muscles. The accessory and essential muscles of respiration are engaged. There are frequently movements of the arms, often in the shape of vague gestures. Even the lower limb may be involved in pawing movements. Repetition, the stammerer himself, tends to involve the consonant immediately before the descent of inhibition. There is some similarity between the repetitions of the stammerer and perseveration of the motor aphasic. Phonation of a wild and unmuted character often replaces repetitive efforts. The one constant element in this complicated display is loss of speech—speech-paralysis—and this may be the only feature.

In normal, "useful" speech there is said to be bilateral control exercised by a single eupraxic centre for motor speech. In stammerers there is some reason to suppose that the discharging "centres" are duplicated. When stammerers speak normally there can only be one discharging path in operation. It is conceivable that the phenomenon of stammering occurs when there is dissynchronous discharge along both paths. The precise reasons determining such a bilateral discharge cannot be stated. It may, however, be relevant to recall the argument for the retention of emotional speech in the old major hemisphere, and to point to the frequent association of stammering with words, themes and circumstances carrying an emotional charge. Bilaterality of itself suffices to explain dissynchrony. Two sites of discharge, evolving at different periods in the individual's development, and in different parts of the brain, cannot have exactly similar time-relationships to the area of the motor cortex which they both control. If both are discharging, similar impulses will arrive at the same area of the cortex, but out of step. The likely result of this ungeared series of impulses will be to result in local inhibition of cortical response. This may be adduced as the case of the speechlessness of the stammerer. If so, it can be stated that such bilateral cortical inhibition is followed by a series of involuntary movements proceeding in an irregular march, and in a setting

of consciousness. One may suppose that such local cortical inhibition would result in the release of a local dysrhythmia. If this is present, it is accompanied by involuntary movements of a kind not unlike those of focal cortical epilepsy. The similarity is obviously far from complete. The regular, spreading, largely unilateral clonus of the Jacksonian fit is mimicked only at a distance by the accessory movements of the stammerer. These are not only more tonic, and less one-sided—they are probably not completely involuntary. Nevertheless, they provide a case for examination by electro-encephalography. Stammerers will show a higher percentage of dysrhythmics than the general population, by reason of their neurotic tendencies. Allowance must be made for this in assessing the results of any such examination. This should be confined to severe stammerers, and repeated records should be made in the stammering-fit itself.

The view put forward in the first sentences of the above paragraph is not unlike that put forward by Travis (1931) in different terminology. Travis's views are summarized thus: "The factors of striking etiological significance in stuttering indicate that the lack of a dominant speech-gradient in the central nervous system permits a competition to arise between equal gradients of control, particularly between those in the right and left cerebral hemispheres. The competing gradients cancel each other; the antagonism between the left and the right cerebral hemisphere acts to block out functioning." The diagnosis of cortical inhibition receives some support from Travis's comment on the tongue. "The more or less continuous action-current activity present in the record taken (from the tongue) during normal speech is altered in the record taken during stuttering by periodic discharges of relatively high frequency (40 to 50 per second). The latter high-frequency discharges are interpreted to be characteristic of uninhibited lower-level functioning. We should assume the gradient of excitation responsible for them to be resident in the sub-cortical centres." The suggestion that stammering movements may represent a disorderly epileptic mutate makes relevant the observations of G. Steiner (1914). After noting the high incidence of left-handedness among epileptics, and Redlich's explanation—that a lesion of the left brain causes both the fits and the change of handedness—Steiner points out the high incidence of left-handers in the families of epileptics, and relatively high incidence of epilepsy in left-handed families. He regards epilepsy, stammering and left-handedness as constellar characteristics tending to crop up in certain families, though apparently not necessarily in combination in single individuals of the family.

In rare instances, the subjects suffering from late aphasia are found to have their speech-areas on the same side as the leading hand. They are, of course, only a fraction of the total number of individuals with a similar disposition of speech-areas and handedness. They may be assumed to occur in the general population in a proportion equal to that of the "homolateral" aphasics in the total number of subjects developing late aphasia. As has been noted, they lead to errors of topographical diagnosis which may be serious when the aphasic lesion is a neoplasm. Their explanation is a matter of difficulty. A tentative and most speculative note has been included earlier in this section,

suggesting their possible genesis among partial sinistrals, with bilaterality of the speech-centres and loss of parity between the dominant speech-area and the connected hand. Such a suggestion, it must be confessed, denies the theory by which the control of handedness by speech is elevated to a rule. One can only state that the theory pursued in this and the preceding section does not appear wholly adequate to explain such cases.

There is, however, one group of individuals who fulfil the requirements of the advanced theory, and of clinical experience. These are the sufferers from early traumatic dysphasia. In the previous section it is stated: "In (early) traumatic dysphasias where there is recovery of speech by transfer of the speech-centres, there must subsequently be alteration of handedness. . . . The alteration of handedness will be opposed by two influences. In the first place the child will have memories and habits of use of the previously leading hand. In the second place the alteration will normally be from right to left. The emerging use of the left hand is likely to be checked, as it frequently is in native sinistrals." In other words, the handedness of the hand in connection with the speech-centres will in these individuals receive minor emphasis. If they in later life sustain a lesion of the speech-area, the resulting aphasia is likely to lead to faulty diagnosis of the lesion. The lesion will, from considerations already stated, be right-sided; and the aphasia will be an aphasia of the (apparently) right-handed.

A concluding note on the influence of stammering in the production of a secondary error of speech may find a place here. Bad spelling in the absence of intellectual or educational defect is due to faulty habits of reading. Words that are poorly attended to in reading are inexactly memorized and visualized, and inaccurately reproduced in writing. Habitual brief attention develops in the earliest days of reading when the latter is public and audible. The impulse to withdraw attention is due to difficulties in the enunciation of words. Stammering is the commonest difficulty at that age. Bad spellers, in the writer's experience, commonly stammer or have a history of stammering while reading was acquired. Intelligence may ingrain rather than correct the habit of visual elusion, since to a quick intelligence meaning leaps from imperfect visual clues. Writing itself, by bringing on a stammer, may cause deterioration in reading and spelling inconsonant with previous progress. It is to be noted that bad spelling is a graphic or dyspraxic error resulting from a defect on the sensory or receptive side of speech. This is in line with the brief reference to apraxia made in the following section. Again, stammerers tend to be mirror-writers, or to have a history of mirror-writing. In these there is a tendency to overflow from the leading mirror-writing hand to the forward-writing hand, and this may produce reversal of letters, reversal of syllables, and backward slope. While the first is readily corrected, the second may persist as a pure error of written spelling. Mirror-writing also, by provoking a tendency to mirror-reading, leads to difficulties in forward reading which increase the chances of spelling error among the left-handers and the stammerers. Association between crossed laterality and bizarre deformities of spelling has been recorded by Moodie (1940), who regards the crossed laterality as the responsible agent. It is at least an alternative hypothesis to regard the crossed

laterality as a result of a cross-over of handedness which, by producing stammering, leads to errors of spelling in the way outlined above.

EXECUTIVE APHASIA.

The proposition is advanced that executive aphasia is usually dysarthric in sum or in part, and that the dysarthria arises directly from a unilateral cortical lesion in area 4c (Brodmann). Marie (1906) expressed a somewhat similar view. He regarded Broca's aphasia as a syndrome in which anarthria is yoked to sensory aphasia by the simultaneous occurrence of lesions in the lenticular zone and in Wernicke's sensory zone. Recently, Nathan (1947) has observed the occurrence of dysarthria developing as a result of facial apraxia, and suggests that such may be the origin of dysarthric symptoms in Broca's aphasia. He placed the unilateral lesion in the lower part of the pre-central gyrus, or deep to it. The writer regards unilateral cortical dysarthria, with or without apraxic dysarthria, as the common essential disturbance of speech in executive aphasia.

(i) Motor, expressive, executive or subcortical aphasia differs from the aphasias categorized by Head (1920, 1926). The latter are probably cortical, display intermingling, and are marked by disturbance of symbolic thought and expression. Further, they are accompanied by affection of inner speech. The purity and consistent symptomatology of executive aphasia are well known. Walshe, for example, (1947) writes of it as the "isolated loss of a specific educated skill, other skills being left intact." There is no intermingling; though there may, of course, be addition from the presence of other aphasic lesions. Again, executive aphasia is not a true disorder of symbolic thinking. There is a loss or paucity of symbols; but the power to represent objects and ideas by symbols is retained. These may have to be invented, and thus have significance only for the subject, or he is driven to use circumlocutions in order to communicate his meaning. It is this restriction of the means of communication which suggests a defect of symbolizing power, where none in fact exists. Furthermore, inner speech is not invariably defective. If it is defective, this, in the writer's belief, argues poor literacy and probably lifelong intellectual disability. Reading in the semi-literate involves the use of the executive path, even when the person reads "to himself." Reading is therefore impaired among these in executive aphasia (Walshe, 1944). Inner speech may similarly proceed by the subdued use of the executive path, and similarly be impaired in executive aphasia. But when inner speech is completely emancipated from verbal action, it will escape. If a lesion destroys the capability of emancipated, or imagined, inner speech, should it not produce aphasia in educated persons, and spare the poorly literate? The proposition is that the lesion acts directly on the executive path in the latter. It acts on the image, which acts on the executive path, in the former. Executive aphasia can occur without impairment of propositive or imaginative power in these, and therefore without disturbance of inner speech. Loss of propositive capacity shuts off speech in all cases. Then, in some cases, executive aphasia affects inner speech; in some cases it spares inner speech; in all cases loss of propositional

power destroys speech ; loss of imaginative power affects word-formation only in the intelligent literate. The latter retains his freedom of thought in executive aphasia, but becomes vulnerable to lesions which do not affect his ill-educated brother. The dictum of Hughlings Jackson, adopted by Head, that inner speech is invariably affected in aphasia, is true only of the semi-literate in executive aphasia, and true mainly of the literate in cortical aphasia.

Since executive aphasia differs so radically from the aphasias surveyed by Head, the suspicion that it may not be a true aphasia is justified ; and it may be suspected also that the symptoms are dysarthric if not aphasic. It is true that a dyspraxic lesion, equally with a dysarthric lesion, disavows Head's aphasic characteristics. But the theory of eupraxic control of speech is itself suspect, having regard to the admitted sway of the distance receptors in skilled performance. Nor is it true to say that the distinction between dysarthria and dysphasia is merely verbal, and that the condition is denied the title of aphasia only because it falls outside the limits posed by Head. For the aphasias of Head, and the dyspraxic theory of aphasia, require a supra-pyramidal lesion ; while the symptoms observed, if dysarthric, are the result of a lesion at the head of the pyramidal path. In short, if Head's categories are complete, executive aphasia is not an aphasia, and the alternative description may be the single one of dysarthria, with regional and physiological, as well as titular distinction.

(ii) Frankly dysarthric symptoms are common in executive aphasia, and may survive after the "aphasic" or "dyspraxic" element has disappeared ; this may indicate a tendency for anarthric lesions to recover through a dysarthric phase. It is difficult to account for them if only one lesion, in the eupraxic area, is responsible. Nathan has indicated that facial apraxia may result from simple extension of the lesion to area 4C. But apart from dysarthria so produced, dysarthria can accompany aphasia only if a two- or three-point breach occurs, interrupting both pyramidal tracts in addition to Broca's node or its emissive fibres. On the other hand, if it is conceded that cortical dysarthria can result from a single injury, to the apex of the left pyramidal path of speech, and this directly, rather than through the agency of facial apraxia—then the mechanism of a simple explanation of dysphasia—dysarthria is at hand, for these can be envisaged as occurring as the result of a single circumscribed lesion.

(iii) In the present state of knowledge Broca's node is a Euclidean reality, having existence without position or magnitude. Nevertheless, a basic structure can be assigned to it, resting on the usual theory of its action. It is believed to control both internuncial (Walshe, 1947) pyramidal paths of speech, and to pass identical impulses to the heads of each path with such exact adjustment that they reach the muscles of articulation without fringing. There is centrifugal discharge along two sets of axons, one set being commissural. The discharge is so timed that impulses reach the end of the longer commissural path at the same instant as similar impulses reach the end of the shorter path. The discharging focus is more complex than a single cluster of cells, each of which discharges along two axons. For unipolar cells in man govern centripeto-centrifugal fibres, and bipolar cells are confined to the ganglion-clusters of the

VIIIth nerve Unilateral control of right and left paths must be subserved by a double bank of cells, one bank controlling one pyramidal shaft. Afferent informative impulses from widely-separated auditory, kinaesthetic, cerebellar and visual zones discharge upon both banks in such a manner that the banks act on them in concert. Each pair of discharging cells must therefore be linked by one or more mediating receptor cells. Both banks are coupled by a belt of receptors. Such is the minimum requirement of theory. But there is no evidence at all that such a three-in-one structure exists in the frontal cortex. If, however, the theory of unilateral control of bilateral paths of speech is set aside, if the eupraxic node is held to discharge upon one path only, then a simple cluster of cells will represent adequately the node of Broca. The minimum number of Broca cells will be reduced by two thirds.

(iv) Unilateral electrical stimulation of area 4C excites bilateral synchronous response in the speech-muscles (Horsley and Schafer, 1887). The response is a primitive phonation. When making long sequences of small movements under the remote guidance of the eupraxic node, the muscles of phonation produce the sounds of speech. The "melody of movement" (Huglings Jackson) unites with the melody of language. Since stimulation applied to the head of one pyramidal path produces phonation, and phonation under eupraxic direction is raised to the power of speech, it follows that one pyramidal path and one eupraxic path suffice for speech. Such is admittedly the case in single capsular lesions, where speech continues, mediated by the uninterrupted pyramidal path. There are, indeed, two equipotent sets of pyramidal fibres, a left leaving the cortex close to Broca's node, and a right having its head in the opposite area 4. Given the speech-area in its usual position, the arrangement figured (Fig. 1) is adequate for all cases and conditions except interruption of fibres descending from area 4C(L). That is, with Broca's node discharging upon the head of the left pyramidal path only. Is it not difficult to believe that a high-level structure of the importance of Broca's node is duplicated, and its outgoing paths are duplicated, in order to deal with the single case of traumatization of one pyramidal tract? Is it not more feasible to believe that the node is single, with a single outgoing path, and that coupling occurs at the pyramidal level, where duplicity of the speech-path is first unmistakably observed?

(v) Instead of two strands of Broca fibres connecting both pyramidal paths to the Broca node there is, it is believed, a simple connection or coupling of the pyramidal cells at their heads. Impulses deposited through the single eupraxic channel on the head of the left path are thereby spread to the head of the opposite path. There is then synchronous transmission of impulses down both paths. The impulses producing speech are transmitted through a single "driving-rein" to the left cortex, which is cross-tied to the right.

Some limited inferences regarding structure can at once be drawn, if such an arrangement indeed exists. At and near its origin each pyramidal path of speech contains equal numbers of direct and decussating fibres. The direct fibres supply all the cells of origin of the nuclear organ on one side. The decussating fibres supply all the cells of origin of the nuclear organ on the opposite side. Each cell of the nuclear organ is in receipt of two supranuclear

fibres, one from each motor cortex. Each movement of articulation is subserved by at least two linked *and similar* pyramidal cells and axons. The head of the direct pyramidal fibre or fibres subserving adduction of the left vocal cord is coupled to the head of indirect fibres, in the opposite cortex, subserving

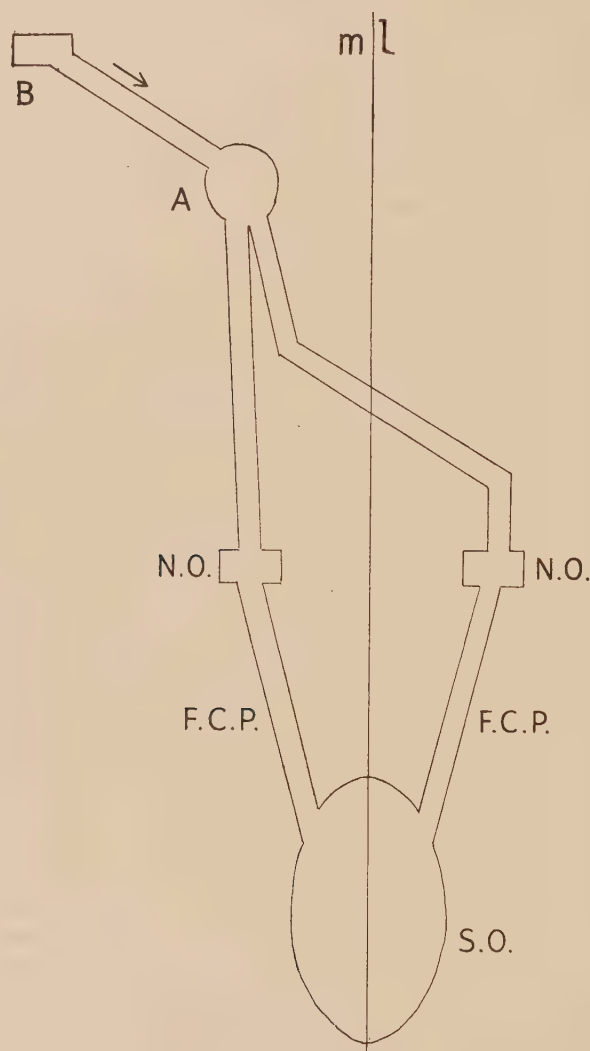


FIG. 1.—B = Broca's "centre." A = Head of left pyramidal path of speech. N.O. = Nuclear Organ. F.C.P. = Final common path. S.O. = Speech Organ. m.l. = mid-line.

the same movement of the same cord. This statement appears true by inspection; but, if not, a little consideration will verify it. The arrangement permits the production of anarthria by a single cortical lesion in the left area 4C. (v. inf.). If linkage is not between cells of identical function, a lesion destroying half the cells at A (Fig. 2) would obliterate an equal number

of dissimilar cells at B. The projection on the nuclear organs of unaffected pyramidal cells would permit a complete registration of speech-movements on that level, and speech would be unaffected. A lesion advancing across the

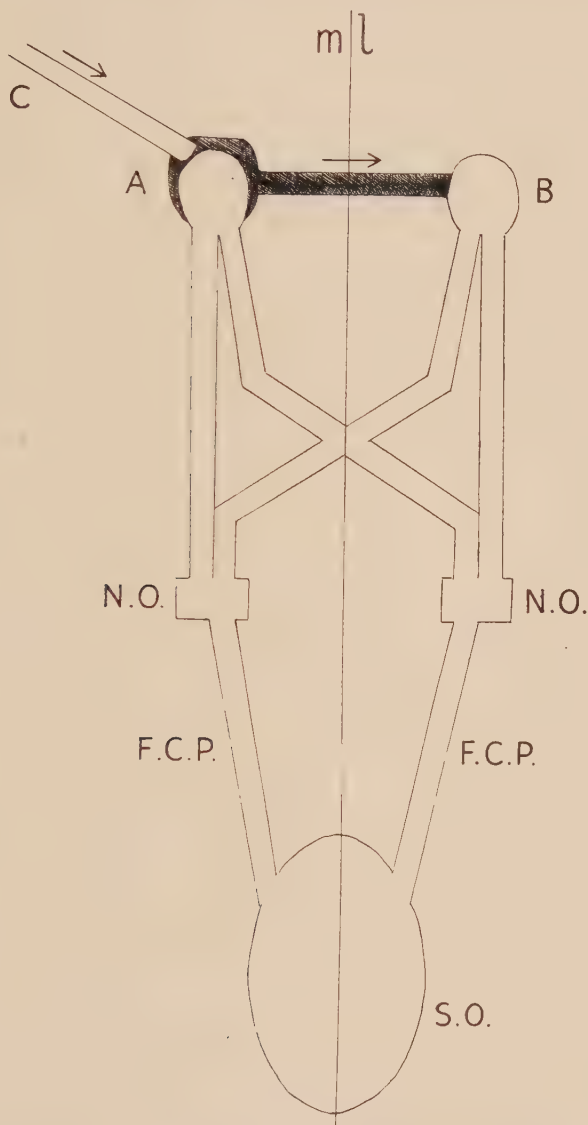


FIG. 2.—A = Head of left pyramidal path of speech, with cap of connector cells. B = Head of right pyramidal path of speech. C = Path of sensory impulses. N.O. = Nuclear Organ. F.C.P. = Final common path. S.O. = Speech Organ. m.l. = Mid-line.

pyramidal node A would produce no result when it destroyed half the node. But destruction of the other half would produce total impairment of speech. And this doubling effect would arise whatever fraction of the second half were

destroyed ; destruction of a quarter would knock out half the movements of articulation, and so on. Such a result is not impossible, but its oddity strongly favours a linkage of like cells. A lesion destroying half the cells at A must produce "homonymous hemianarthria." Moreover, the couple cannot be executed by direct connection between two Betz cells or similar cells. The left cell cannot directly influence the right cell by means of a tangential commissural fibre. For such a link would be destroyed by a left pyramidal lesion ; the right path would be isolated, and speech would fail. A second cell, in close contact with the left Betz or Betz-like cell, and influencing the like cell on the right side by a commissural axon, must form the link. These connector cells must constitute a cluster or cap of cells lying intermingled with the cells composing the head of the left pyramidal stalk of speech. It is from them, and not from the cells of Broca's node, that the fibres of the speech-commissure run. It is upon them, and not directly upon the left pyramidal cells or fibres, that the Broca cells discharge, and to which they are connected by emissive fibres. This discharge is unaffected by the death of one pyramidal tract. Nor does such a death, even if left-sided, prevent the conduction of impulses to the head of the intact path. The function of the couple is to ship identical loads of impulse down each pyramidal path. Furthermore, the couple from left to right must be balanced by a couple from right to left. This is demonstrated by the use of an alternative path in those cases where speech crosses to the right hemisphere. In such cases, and in the left-handed, impulses will be deposited on the head of the right pyramidal path, and will be passed to the head of the opposite path by a similar relay of right connector cells with commissural axons. The inter-cortical speech-commissure consists, therefore, of two equal roads of fibres running in opposite directions. Only that with its head in the left motor-cortex is normally in use.

(vi) Plainly, such an arrangement renders the subject immune to dysarthria by a single subcortical lesion. It may be objected that it merely transfers or postpones the dichotomy of the Broca tract from its origin to its terminus in the motor-cortex ; replaces an original direct branching by a terminal indirect branching which merely elongates the stem. Its importance, the writer believes, lies in the fact that it permits anarthria to develop from a single cortical lesion. For an obliterative lesion at A (Fig. 2) would utterly deny the subject the power of speech. Conduction along both pyramidal paths would be stopped. Furthermore, such a lesion, involving pyramidal and connector cells only, would produce all the signs of Broca's aphasia without any involvement of eupraxic fibres. Only the movements of speech would be lost. The remaining relatively simple and large-scale movements of lips, tongue, cheeks, jaw and larynx would continue unimpaired. For these the right pyramidal path is available ; which, like the left, conveys impulses enabling these midline structures to move with their parts in synchrony. The movements retained are almost reflex in character. They are in the strict sense unskilled, and can be operated by a pyramidal tract out of reach of eupraxic or skill-centres. Thus the isolation of Broca's aphasia from the area of disturbance of language surveyed by Head becomes intelligible. For in many cases, probably in most cases, the lesion is mainly and essentially dysarthric. It is instructive to read

Broca's own account of his first case of executive aphasia (from Head, 1920), and to reflect that all the symptoms there described can be accounted for by a unilateral anarthric lesion at A (Fig. 2). The brain of Broca's patient showed destruction of the posterior part of the second and third frontal convolutions, of the inferior portion of the Rolandic area, and of the first temporo-sphenoidal convolution. Broca fastened his attention on the anterior lesion; yet it may have been the middle lesion which was the effective agent.

(vii) The design outlined for spoken speech may be enlarged to cover the act of writing. It is possible that two writing-paths, one a forward-writing path running from the right-hand centre of the left motor cortex, the other a mirror-writing path running from the left-hand centre of the right motor cortex, are linked as the two pyramidal paths of speech are linked. It is possible that connector cells lying adjacent to the right-hand centre pass commissural fibres to the left-hand centre, binding the two together. Many years ago Erlenmayer (1879, summarized by Critchley, 1928) indicated the probable explanation of mirror-writing by an extension of the statement that "the most natural movements for one hand are the mirrored replica of those of the opposite hand." Such a statement is readily understood if linkage at the motor-cortical level exists between the hand areas of the brain. For mirror-writing is a faithful copy by the left hand of the movements of the forward-writing right. And the postulated link would run between cells subserving similar movements. Adduction of the right thumb is subserved by a cell or cells linked to a cell or cells subserving adduction of the left thumb. The link makes it possible for the writing right hand to guide or train the left in similar movements, i.e. in mirrored writing, and this guidance persists in spite of the inhibition of the left hand. Left-handers are facultative mirror-writers. The best way to teach them writing may be to teach them to write mirror-writing with the left hand. In the process, the right hand will come by a linked facility in forward writing. What tells against this suggestion is the tendency to overflow from the leading hand. This may produce a crop of errors of written spelling. The well-known "escape" of left mirror-writing in right hemiplegia is strictly comparable to the persistence of speech along the undamaged pyramidal tract in right capsular hemiplegia, in both cases made possible by a commissure between pyramidal nuclei. Such a commissure provides a simpler mechanism of mirror-writing than the right-brain schemata suggested by Brain (*ibid.*). In the writer's belief, speech impulses in writing are deposited upon the right-hand centre after traversing the same route as when they pass to the motor cortex subserving articulatory speech. If this is true, it follows that an intimate connection exists between the cortex of articulation and the cortex of hand-movements—between the "mouth" and the "hand" areas. And here may lie the clue to the dependence of handedness on speech. Action dependent on vocalized thinking occurs before writing, but is closely allied to it. Children speak their thoughts, and act them as they speak them. Such action is well served by the passage of speech-impulses to the right-hand centre as well as to the articulation-area. This may be made possible by the presence of a connector plate. Such a simple structure would permit the early development of handedness, and would facilitate the acquisition of writing. Diminution or attenuation of

articulation in writing probably occurs as the result of an inhibitory effect similar to that which stills the mirror-writing hand.

(viii) In the foregoing account, adult executive "aphasia" is assumed to be present, and in the adult a unilateral cortical lesion at A (Fig. 2) will produce anarthria—granted the suggested coupling-mechanism linking A to B. Such will not be the case in young subjects in whom the power to transfer the speech-nodes is retained. In them, a bilateral lesion is necessary to affect speech permanently. In congenital aphasia, a small proportion of cases will be cases of executive aphasia. These will occur in virtue of a bilateral lesion which is symmetrical, or nearly so, for only thus will the purity of the aphasia be preserved. If the aphasia is in fact and in the main a cortical dysarthria, then by symmetry the lesion at A will repeat itself in the origins of the opposite pyramidal stalk of speech (B). This will produce spasticity, with the hyper-tonic tongue and increased jaw-jerk. But these signs will clearly lead to a diagnosis of bilateral cortical dysarthria, not of aphasia. Congenital executive aphasia will in fact only be diagnosed when there is bilateral involvement of the pre-pyramidal paths of speech. This in the writer's view is an exceptional cause of aphasia (see ix, *infra*) even when one-sided, and limitation of congenital executive aphasia to such cases must diminish its incidence drastically. Indeed, the reduced proportion of congenital aphasias which it takes up, as compared with the higher proportion of adult aphasias taken up by adult executive aphasia, is an index of the small part played by pre-pyramidal lesions. Similar considerations apply in early post-natal executive aphasia. Failure to recover speech implies a bilateral lesion. Purity of the aphasia implies symmetry. The presence of dysarthria implies spasticity, and the removal of the case from the category of aphasia. Only those cases which show local, bilateral and symmetrical involvement of the pre- or supra-pyramidal zone will be called aphasias; this will reduce their incidence almost to zero. It is suggested that the rarity of these early cases is a product of the ability to shift the speech-area in childhood. Many cases are called dysarthria which, given rigidity of the speech-centres, would be recognized as strictly comparable to cases of adult executive aphasia. In the adult, loss of the power of transfer of speech results not only in permanent dysarthria of unilateral origin, but also in avoidance of spasticity, through the intact preservation of one pyramidal path.

(ix) Lastly: the presence of a node or centre of Broca has been assumed throughout this paper. Its functions, following Walshe, have been understood to be those of eupraxic initiation and control of speech. For reasons arising out of the proposition advanced in this section, and for others now to be stated, its existence is believed to be an unnecessary assumption.

(a) The clinical evidence of the existence of such a node is the occurrence of executive aphasia, where the essential lesion is believed to be damage to the "appropriate eupraxic centre." But if executive aphasia is in fact a cortical dysarthria, as is stated in this section, then much of the evidence for a eupraxic centre disappears. Its existence is based on the fact that speech-movements can be destroyed by a lesion which permits other movements of the muscles of articulation. These movements are held to prove the integrity of both pyramidal paths, and, therefore, to "place" the lesion in the supra-pyramidal zone.

But if it had been known, or suggested, that such a lesion could be a unilateral cortical dysarthria, it is, in the writer's view, unlikely that the theory of a eupraxic centre of speech would have gained general support, more especially since the centre has evaded localization. Further, it is not improbable that those lesions which produce executive aphasia by a small subcortical wound would have been regarded as interrupting the condensed sensory strands passing to the connector cells of the articulatory area of the cortex; instead of—as now—as cutting the emissive fibres passing from a eupraxic centre to both pyramidal tracts. It may be objected that since part of the argument of this section rests on the existence of a Broca centre (see iii, iv, v, *supra*), it is introducing circularity to make the conclusion the absence of a Broca centre. The paragraphs referred to, however, point in the direction of attenuation of the centre, and it is not illogical to advance the argument to a stage which attenuates it out of existence.

(b) Lashley (1937) regards co-ordination of movement in time and space as separate functions of the cortex which necessitate spatial separation of the fields concerned. Walshe (1947) by an adaptation of Lashley's views suggests that the field of co-ordination in time is the field of the eupraxic level. He regards the eupraxic centre of speech as the temporal co-ordinator of the movements of speech, a single example of the role of eupraxic centres in bodily skills. If co-ordination in time is indeed the essential function of the eupraxic centre of speech, it supplies its chief reason for existence. Its existence thus depends on the truth of the stated concept of time. If the latter is untrue and illusory, the centre cannot exist. The attitude towards time shared by Lashley and Walshe is the attitude to an extra-mental reality. This agrees with the "commonsense" view (Bertrand Russell, 1946, p. 860), and the ascription of a dimension merely adds verisimilitude. But it by no means agrees with the views held by trained philosophers, either now or in the past. In *History of Western Philosophy* (Russell, *ibid.*) references to the views of eleven writers are indexed. Of these, all, save Plato and Aristotle, from St. Augustine to Spinoza, regard time as a product of the mind and not as something existing apart from minds. It is true that Russell himself, together with Whitehead, does not agree with these accounts. He draws on the special theory of relativity, in which Einstein rescues time from subjectivity in the unlovely attire of space-time, and in which "'matter' is . . . merely a convenient way of collecting events into bundles." But Lashley implicitly denies the hypothesis of space-time by separating the co-ordinators in space and time, and indeed, stating that such a separateness of localization is a functional necessity. If time is non-existent, or existent only as space-time, then the functional basis of a eupraxic centre of speech collapses.

Also, if Walshe's suggestion of temporal co-ordination is examined, it is seen to invest the eupraxic centre with very complex functions. It must be able to put out impulses at the correct instants in relation to the time of the task (of speech) and must therefore, it seems, contain a clock so that the intervals between impulses can be accurately measured. Not only that, but some knowledge of the duration of the task by the clock appears to be necessitated. It is true that "timing and variations of timing are the central

significant measures for all kinds of bodily skill" (Bartlett, 1947). But is it not more accurate to regard this timing as a faculty of the whole man, the skilled person, rather than as the result of the exercise of an automatic regulator in the brain? The former view is surely supported by the influence of volition and urgency on effector response (Bartlett, *ibid.*). In brief, the eupraxic centre cannot, in the writer's view, have the function of temporal co-ordination ascribed to it by Walshe. It must, then, either have a different function or have no function—that is, be non-existent.

(c) The receptors, particularly the distance receptors, are of paramount importance in the initiation and control of willed movements. Sherrington, Adrian and Bartlett, quoted by Walshe (*ibid.*), all express this view, which is admirably phrased by Walshe himself. "The distance receptors are the great initiators and directors of all those sequences of willed movement, simple and complex, short and long, anticipatory and consummatory, that compose the willed mobility of the intact individual." Skilled movements are willed movements, and speech is an outstanding example of an educated skill. It, too, must be driven and guided by the receptors. But if these are the paramount operators of speech, where is the need for a eupraxic centre of speech? If speech proceeds under the influence of a eupraxic pattern-discharge, the latter needs no more than a firing stimulus on the sensory side. If it proceeds under the control of sensory impulses, then the eupraxic centre is supernumerary. If the centre indeed exists, the sensory strands must come to a focus in it. A lesion cutting these focussed fibres just caudal to the centre will clearly produce all the signs of a lesion obliterating the centre. That is, a lesion on the sensory side will produce all the signs of an executive apraxia. Is it not simpler to believe that the sensory or instructive fibres are brought to a focus directly on connector cells in the left motor cortex, and that their interruption is responsible for subcortical executive aphasia? The writer believes that such cases are rare examples of executive aphasia, which is more usually, in his contention, a unilateral cortical dysarthria. But in either case the condition is adequately accounted for without the intervention of a eupraxic centre. The argument implies that all apraxias may be due to lesions on the sensory side, and possibly leads to a recasting of views on the nature of apraxia. Such an implication is supported by the occurrence of apraxia, as in Liepmann's apraxia and agraphia, as in Gerstmann's syndrome, in lesions of the parietal cortex which are cytologically leagues away from the executive path.

The propositions advanced in this section can be summarized as follows. There is no Broca centre of speech. Admittent, instructive or sensory impulses pass directly to the head of the pyramidal articulatory path in the left motor cortex. This is linked to similar cells in the opposite cortex by a relay of commissural fibres running from connector cells in close contact with the head cells of the left path. The sensory impulses discharge upon the connector cells. A single lesion obliterating the connector cells and adjacent pyramidal cells will produce all the signs of Broca's aphasia, and it is in this way that it is usually produced. Writing may be produced by the spread of afferent speech-impulses by a connector plate to the hand-centres, similarly linked. In this connection may lie the clue to the dependence of handedness on speech. Some cases of

executive aphasia result from interruption of the afferent speech path just before it breaks on the cluster of connector cells. Since in this way an apraxia results from a purely sensory lesion, some light is thrown on the occurrence of dyspraxic lesions in the receptive area of the speech-cortex.

CONCLUSION.

The variety of themes in the foregoing notes impedes a general discussion. The paper is itself, in the main, a discussion of well-known clinical facts, whose reinterpretation has been tentatively put forward. For that reason there is a lack of case-material. Though a few suggestive cases have lately been seen, they cannot be said to contain anything new in themselves, and it was not felt that their inclusion would strengthen the argument. Certain lines of enquiry, however, show up, and may be worth pursuing. Gordon's work is so well-substantiated that it seems profitless to repeat his investigations. But stammering and bad spelling can be investigated on the lines suggested. Further, the author has noted what may be an association between exceptional height and left-handedness, and this may be worth following up. In general, however, the paper is offered as an excursion in theory, which may perhaps be considered to stand on its own feet without fresh clinical or experimental facts at this stage. No man can solve the complicated questions of speech and handedness by merely taking thought. The author is keenly aware of a lack of personal authority and experience which would add weight to views at times unorthodox. Nevertheless, these views are put forward, in the hope that they may provide a stimulus to abler minds to further the elucidation of the mysteries of speech.

SUMMARY.

(1) The existence of a causal link between speech and handedness is proposed. The proposition is applied in the consideration of the handedness of defectives, congenital aphasia, and early post-natal aphasia.

(2) Stammering is considered in the light of the same proposition; the view is expressed that it may arise out of bilaterality of the speech-centres.

(3) A dysarthric component is suggested in the case of executive aphasia. An anatomical configuration is outlined which would make this possible. The theory of eupraxic control of speech is criticized.

(4) Some lines of enquiry are indicated.

ACKNOWLEDGMENTS.

The author wishes to record his indebtedness to Dr. P. K. McCowan, Dr. W. Mayer-Gross, and to Dr. W. Russell Brain for their helpful criticisms and advice.

REFERENCES.

- BARTLETT, F. C. (1947), *Brit. Med. J.*, i, 835.
 BRAIN, W. R. (1945), *Lancet*, ii, 839.
 CREW, F. A. E. (1947), *Genetics in Relation to Clinical Medicine*. Edinburgh.
 CRITCHLEY, M. (1928), *Mirror-Writing*. London.
 ELKINTON, J. St. C., and MARTIN, J. P. (1946), in *A Text-book of the Practice of Medicine*, edited by F. W. Price. London.
 GORDON, H. (1920-21), *Brain*, **43**, 313.
 HEAD, H. (1920), *ibid.*, 87.
 — (1926), *Aphasia and Kindred Disorders of Speech*. Cambridge.
 HORSLEY, V., and SCHÄFER, E. A. (1887), *Philos. Trans.*, Feb. 17.
 KALLMANN, F. J. (1948), *J. Ment. Sci.*, **94**, 250.
 LASHLEY, K. S. (1937), *Arch. Neurol. Psychiat.* **38**, 371.
 MARIE, P. (1906), *Semaine Med.*, **26**, 241. Paris.
 MOODIE, W. (1940), *The Doctor and the Difficult Child*. Oxford.
 NATHAN, P.W. (1947), *Brain*, **70**, 449.
 ORTON, S. T. (1937), *Reading, Writing and Speech Problems in Children*. New York.
 RUSSELL, BERTRAND (1946), *History of Western Philosophy*. London.
 STEINER, G. (1914), *Zeitschrift für die gesamte Neurologie und Psychiatrie*, **23**, 315.
 TRAVIS, L. E. (1931), *Speech Pathology*. New York.
 WALSHE, F. M. R. (1944), *Diseases of the Nervous System*. 3rd ed. Edinburgh.
 — (1947), *Brain*, **70**, 329.
-

ABNORMAL BEHAVIOUR AND MENTAL BREAKDOWN IN ADOLESCENCE.

By W. WARREN, M.A., M.D., D.P.M.,

Assistant Physician, Bethlem Royal Hospital and the Maudsley Hospital, Denmark Hill, S.E.5.

YOUTH is an elusive period of life, and although it has been considered from many points of view, it remains an intricate and unpredictable epoch, for which further study is needed to bring it into clearer perspective.

As the child grows into an adult, physical and mental changes of fundamental importance take place, and this evolution should be a gradual process free from disturbance, of which the adolescent may be almost unaware. How often this is so is difficult to estimate, but many factors are involved, and emotional disturbances from the most trivial to the most serious may occur. It is also difficult to define where the readjustments of normal growing-up end and abnormal disturbances begin, adding to the diffuseness of these problems. Any factual information on the factors involved in abnormal behaviour or mental breakdown at this time of life is of interest, and may help towards their understanding.

OBJECTS OF THE PRESENT INVESTIGATION.

In spite of the range of writings on adolescence, there are few surveys of the aetiology or symptomatology of mental disturbances at this age, particularly in regard to the many factors involved, besides the important physiological and psychological changes of adolescence itself. Undue weight may be given to adolescence as the main factor in the description of upsets at this age, perhaps because of the amount of work that has been devoted to psychological development, and too little attention paid to their other aspects. It would seem important for the full knowledge of a mental breakdown at this age to have the background and framework of the aetiology and symptomatology, to view the picture as a whole. The one cannot properly be viewed without the other.

A group of adolescents was therefore taken who were showing abnormal behaviour or mental breakdown severe enough to require admission and treatment in hospital. The group comprised widely different psychiatric illnesses, the only common factor being adolescence, and an attempt was made to analyse and assess the aetiological factors apparent in their history, background, and in their previous personalities. The abnormal traits and symptoms shown prior to their illness were examined, as also the symptoms of their present illness. Finally the relevance and significance of the physiological and psychological changes of adolescence were considered as factors, both from the aetiological and symptomatological points of view.

The objects of this investigation are therefore three in number, to try and determine :

(1) What aetiological factors there are in these patients and their background, their incidence, and to what extent these factors can be said to be causative in leading to abnormal behaviour or mental breakdown at this time.

(2) What abnormal symptoms and traits are shown by these patients either in their previous life or personality, and the significance if any of the relationship or development of these symptoms into the present illness or abnormal behaviour now showing in adolescence.

(3) To what extent adolescence can be said to be causative or contributory to this illness or abnormal behaviour, and how far or in what way the symptoms shown by them can be considered to be peculiar to or coloured by adolescence.

They will be considered in turn and investigated by statistical methods where relevant. It is suggested that by these means the psychiatric disorders of adolescence can be viewed in perspective in regard to the factors that led up to and compose them, and an estimate perhaps made of how far adolescence is of importance as such in their aetiology.

This group may be in a minority amongst the total number of adolescent disturbances, and in their relative severity have a more significant aetiology than the numerous lesser emotional difficulties of the period ; difficulties that may lead to delinquency, a request for medical advice, or in many cases maladjustment and unhappiness for which no help is sought. Nevertheless, it is considered that the multiplicity and nature of the factors involved in their aetiology and symptomatology may be of help towards the understanding of adolescent disturbances as a whole.

It can be argued, as Schwab and Veeder (1) did, that abnormal types are too far away from the average to give exact data applicable to the whole, so that due caution is necessary in interpreting their significance. However, Finesinger (2) stressed that the body and behaviour of man is the product of what has gone before ; and the physical structure as also the behaviour and even the social difficulties of the adolescent have their origin in the previous stage of development. He considered that adolescence could not be wholly considered separately from what has happened in earlier childhood. Yellowlees (3) also stated that "trouble in adolescence rarely comes out of the blue. There is, as a rule, the strongest possible evidence that the mischief has already been done, and that previous danger signals have been ignored. Conversely, the one all-important factor in determining a healthy and happy adolescence is the upbringing which has preceded it."

This group of abnormal adolescents would seem in many cases to bear out the importance of this concept.

THE MATERIAL.

The material consists of nearly all the cases of adolescent age admitted into the Maudsley Hospital between October, 1945, and October, 1947.

The ages of the patients range between 13 and 18. In the case of girls it was decided to include only those who had begun to menstruate and had

reached physiological puberty. In boys there was no such definite criterion. The onset of seminal emissions has been considered indicative of sexual maturity, but it is not always easy to ascertain their presence from the patient. Shyness, ignorance or possible misunderstanding made it doubtful in many cases. Again, as an alternative criterion an estimation of the development of secondary sexual characters is uncertain. In view of this the age of 14 was taken as the lowest age for inclusion for boys, although it is of necessity an arbitrary lower limit which does not necessarily mean the attainment of puberty, as some boys were notably immature.

The age range chosen is in any case artificial, and was partly dictated by the ages of the adolescent patients admitted. It is a truism that childhood problems gradually merge into those of adolescence and thence into adulthood, and psychiatric disorders frequently arise in the prepubertal years. Adolescence includes puberty, and these prepubertal problems are often interdependent on it and could properly be included in an adolescent series. However, their inclusion would widen the scope of this study too much.

The total amounts to 50. They were closely observed over the time of their in-patient treatment and some were followed up. This total is small, but it is considered of value owing to the care taken in ensuring accurate detail of the case-material, and because few investigations of this sort could be found. They were widely assorted, consisting of 24 girls and 26 boys. They came from different social conditions, from those (6 cases) who were comfortably off, to the very poor (3 cases), although the majority (41 cases) were from working-class homes. Most had their homes in London, but a few came from the country, or had been brought up abroad. Of the 24 girls, 15 had left school or had started work, 5 were still at school, 3 in college, and 1 in an approved school. Of the 26 boys, 19 had left school or were at work, 7 still at school, and 1 in an approved school. There was no special choice of case.

THE METHODS OF INVESTIGATION.

All but one of these patients were looked after in the adult wards, and this case was treated in the Children's Ward. The right place to treat children of adolescent age is a difficult one, as they can neither be looked after happily amongst adults on the one hand nor amongst young children on the other. There would seem to be a need for separate accommodation for young people, which is not at present available in this country.

The form of case-taking was on a common plan, and the information required to achieve the objects of this investigation was extracted from these records and listed into three main groups for the purposes of analysis, as described below :—

(1) *Aetiology*.—This attempted to cover all aspects, and to demonstrate the various factors which affected the patient and led to the mental disturbance now showing in adolescence. They included :

(A) The endowment of the patient, consisting of—

(a) Factors in the family history.

(b) Factors in the patient, including organic disease in the central nervous system or elsewhere ; any marked deviations of personality ; the level of intelligence ; the electro-encephalogram when recorded.

(B) Factors in the environment of the patient, past or present, comprising—

(a) Those emotionally ill-adapted to the patient in the home or elsewhere.

(b) Those physically ill-adapted to the patient, consisting of poverty, malnutrition, etc.

(2) *Symptomatology*.—The symptoms or traits shown by these patients were divided into those present before the illness began, and those in the present *illness* or abnormal behaviour showing in adolescence. This division, in spite of minor difficulties inherent in any attempt to divide artificially the evolution of a psychiatric disturbance, seemed to be of value in placing these mental disorders in perspective.

Next the dates of onset of the present illness were examined in relationship to physiological puberty, to try and determine any relationship between them.

Finally the individual symptoms were classified under broad headings into natural groups for clarity of presentation ; and examined in detail for any components or relationships with adolescence that became apparent.

(3) The *manifestations of adolescence*, as contributory factors to the mental disturbance in these patients, were next determined, to assess—

(a) How far adolescence could be considered a causal or contributory factor to the mental disturbance or abnormal behaviour.

(b) To what degree their symptoms could be regarded as peculiar to or coloured by adolescence.

Definite conclusions were not expected, but in the light of the present state of the physiological and psychological knowledge of this age, the attempt was made to try to clarify the relationship of adolescence to the mental breakdown or abnormal behaviour these patients showed.

CLASSIFICATION IN REGARD TO DIAGNOSIS.

Some of the cases showed easily diagnosable features, but in others the diagnosis was not so clear, and it was only after careful observation that the case was placed under one heading or another. It is well known how difficult to diagnose may be the symptoms shown in adolescence (4), although according to Kanner (5) they are nearer the lines of adult psychopathologic patterns than those of childhood. It was possible in many cases to apply the psychiatric terminology used for adult cases ; in some cases—particularly in the younger or more immature children—it was more revealing to think of them in the more fluid terms of childhood psychiatry. Some cases were given such descriptive diagnoses as “maladjustment of adolescence,” showing an uncertainty which further observation may resolve.

None has been followed up more than a few months, and there may be need to alter the diagnosis if subsequent developments warrant this. Beres *et al.* (6) stress the difficulties of differential diagnosis at this age, and especially that of psychopathic personality. They describe how cases with such a diagnosis may subsequently become psychotic and *vice versa*. These difficulties naturally apply, and it was with an open mind that they were divided into two main groups—those who showed no diagnosable evidence of psychosis, and those who were considered to have been proved psychotic.

Amongst the non-psychotic group, the greatest number were psycho-neurotics. These included a number of reactions, which followed neurotic patterns, the diagnosis being descriptive. Some of these dated back into early childhood; others were shorter. One may prove to be epileptic and another psychotic in due course—emphasizing the fluidity of classification necessary.

A small group was also included whose symptoms appeared to be more abnormal and irreversible in nature. The distinction between them and the psycho-neurotics was indefinite, and they merged into the more tractable cases of the main group. They included one case (Case 25), who showed the beginnings of serious maladjustment and then sustained a serious head injury, which materially contributed to her symptoms. In two cases (Cases 27 and 28) fairly definite evidence of encephalitis lethargica preceded the onset of severe behaviour disorder. In four cases (Cases 26, 29, 30, 31) a gross and long-standing disorder of behaviour and personality could only be described by the term "psychopathic personality," in spite of the uncertainties of such a diagnosis at this age (6). Such cases have even so shown aetiological factors, potentially damaging in the emotional sense—in common with other types of cases—and whose contribution to the illness could not be assessed. Further observation may reveal the onset of a psychosis, and in two cases at least psychotic features were present. On the other hand, increasing maturity may lead to their amelioration.

It seems that in adolescence such clinical problems have not crystallized out in many cases into the clearer psychiatric syndromes of adulthood, and they retain the more fluid characteristics of the emotional disturbances of childhood. Only time and further maturity will determine the ultimate diagnosis that should be applied. (See Table I.)

AETIOLOGY.

A number of authors express views on the aetiology of abnormal behaviour or mental breakdown in adolescence; many causative factors are stressed by them, but little statistical evidence is offered. Conklin (7) for instance emphasized the significance of the family situation in the formation of the personality of the adolescent, and stressed that any condition or influence that delayed development or reduced the integration of stability, poise and control would be expected to produce instability.

Yearbury and Newell (8), who investigated 56 psychotic children up to the age of 19, concluded that there was a predominance of unfavourable hereditary

tendencies in the parents of psychotic children, emphasized by the fact of a large number of abnormal siblings. They also found such factors as bad homes, and a lack of security in human relationships; psychic traumata too were considered a significant factor in leading to breakdown.

Dorothea Friedlander (9) analysed the records of 27 young people under 20, including 16 cases of schizophrenia, 9 of psychopathic personality and 2

TABLE I.—*Details of Diagnosis.**Non-psychotic Group.*(a) *Psycho-neuroses.*

Cases.	Sex.	Age on admission to hospital.	Diagnosis.
1	Female	15	Adolescent behaviour disorder with mental backwardness.
2	"	16	Anxiety reaction. ? Cerebral agnosia.
3	"	16	Behaviour disorder; reactive to home worries.
4	"	13	Hysteria.
5	"	13	Behaviour disorder with anxiety.
6	"	16	Hysteria. Immature personality.
7	"	15	Reactive depression. Chronic eczema.
8	"	15	Obsessional neurosis.
9	"	15	Maladjustment of adolescence. ? Epilepsy.
10	"	17	Reactive depression. Hysterical personality.
11	"	17	Behaviour disorder. Temperamental instability.
12	"	15	Behaviour and personality disorder.
13	"	15	Reactive depression. Anxiety features.
14	"	13	Anxiety state with hypochondriasis.
15	Male	14	Mental backwardness. Hysterical personality.
16	"	14	Anxiety state. Obsessional and hysterical features.
17	"	16	Anxiety state.
18	"	18	Anxiety state with secondary depression.
19	"	17	Compulsive tics of probable psychogenic origin.
20	"	17	Behaviour disorder.
21	"	17	Adolescent personality disorder.
22	"	14	Behaviour disorder. Mental backwardness.
23	"	17	Anxiety state with obsessional features.
24	"	16	Maladjustment of adolescence. Obsessional personality. Physical immaturity.

(b) *Severe personality disorders or sequelae of organic disease of the central nervous system.*

Cases.	Sex.	Age on admission to hospital.	Diagnosis.
25	Female	16	Sequelae head injury. Psychopathic personality.
26	"	17	Behaviour disorder. Psychopathic personality.
27	Male	17	Behaviour disorder. ? Post-encephalitis.
28	"	14	" " "
29	"	17	Psychopathic personality.
30	"	15	" "
31	"	17	" "

Psychotic Group.

32	Female	15	Schizophrenia.
33	"	16	Paranoid schizophrenia.
34	"	15	Recurrent catatonic schizophrenia.
35	"	16	Schizophrenia.
36	"	16	Mental backwardness. Schizophrenia.
37	"	15	Acute paranoid schizophrenia. Congenital spatial disability.
38	"	16	Schizophrenia.
39	"	15	"
40	Male	14	"
41	"	14	Catatonic schizophrenia.
42	"	17	Paranoid schizophrenia.
43	"	15	Mental deficiency. Hebephrenia.
44	"	15	Periodic catatonic schizophrenia.
45	"	18	Paranoid schizophrenia.
46	"	14	Schizophrenia.
47	"	16	Mental backwardness. Epileptic dysrhythmia. ? Schizophrenia.
48	"	17	Manic-depressive psychosis.
49	"	15	" "
50	"	16	Paranoid state. Friedreich's ataxia. Epileptic clouded state.

of manic-depressive psychosis. She found in all a high frequency of parents who were either rejecting or over-solicitous and over-protective in childhood ; there was a high frequency of extremes of discipline, either too severe, too slack or variable ; there was severe friction in the home of 75 per cent. of the cases of schizophrenia, and 44 per cent. of psychopathic personality.

Such results are suggestive, but they cannot be considered more than this because of the small totals examined, the lack of statistical control, and a lack of information of the ages of the patients.

Analysis of these 50 cases shows a multiplicity of factors, including family inter-relationships, which are of aetiological significance. Unfortunately, through lack of normal controls they cannot be compared statistically with adolescents who have shown no abnormal behaviour or mental disturbance. There is no proof that there may not be a similar number of disturbing factors which normal subjects resist. However, these factors are impressive in their frequency and variety, although statistical analysis must be confined to comparisons within the series.

THE ENDOWMENT OF THE PATIENT.

The endowment of the patient is made up of the factors of generic importance in the family history, coupled with the constitutional factors in the patients themselves, and they will be discussed in that order.

Family History.

This must be judged by the fact that the parents and siblings at least largely determine the environment in which the child is brought up, and any neurotic or psychopathic qualities that they possess are likely directly to affect the environment; it is impossible to separate these from the alternative or co-existent effect that such a heredity is likely to have on the child's constitution.

In this series the family history has been confined to those generations in which inquiries could produce reasonably accurate answers (grandparents, parents and their siblings, and the patient's siblings), and the results for analytical purposes were divided into two groups:

(1) Major psychoses, epilepsy, severe alcoholism, mental deficiency or well-marked psychopathic traits, in direct line or in collaterals.

(2) Minor neuroses, anomalies of personality or delinquency, in direct line or in collaterals, not so severe as in Group 1. They are shown in Table II.

Inquiry was also made into the presence of serious physical disease in these relations, which could be considered important from the generic point of view, but in no cases were these found.

TABLE II.—*Family History.*

<i>Non-psychotic Cases.</i>	Totals.	Major psychoses, etc.	Minor neuroses, etc.
Girls . . .	16	8	7
Boys . . .	15	7	11
Total . . .	31	15	18
Percentage . . .	..	48·4%	58·1%
<i>Psychotic Cases.</i>			
Girls . . .	8	4	5
Boys . . .	11	6	8
Total . . .	19	10	13
Percentage . . .		52·6%	68·4%
Total . . .	50	25	31
Percentage . . .	..	50%	62%

Analysis of Table II.—There is a high percentage of trouble in the families of these patients, but without normal controls no definite conclusions can be drawn. The chi-square test shows no significant difference between the non-psychotic and psychotic groups, nor between girls and boys. The figures appear to be similar to those generally found in the heredity of mental disorder.

Other factors in the endowment of the patients that help to determine their constitution in adolescence are considered under appropriate headings in the following paragraphs.

Serious Physical Disease.

Serious physical disease in the patient either in the past or in adolescence, if it has interfered with physical or mental development or even emotional well-being, may be an important factor in the causation of a breakdown or abnormal behaviour. It is not common in these cases, but its degree of importance can best be judged from study of the individual cases, relevant extracts of which are given below. They are divided into—

- (1) Patients with a history of encephalitis, meningitis or severe head injury.
- (2) Patients with a history of some organic disease of the central nervous system of importance other than those in Group (1).
- (3) Patients with severe physical disease in other systems than the above.

(1) Patients with a history of encephalitis, meningitis or severe head injury.

Non-Psychotic Group.

(a) Psycho-neurotic cases.

CASE 8.—Female, aged 15. Aged four months this patient was treated in hospital with post-basal meningococcal meningitis; long attendance in out-patients followed, and she was, until the age of two, supposed to have had a "large head." Her present illness was that of obsessional neurosis, to which a number of factors contributed, and which developed out of a long-standing neuroticism. The effect of her physical illness on the aetiology could not be estimated.

CASE 10.—Female, aged 17. This girl, of low average intelligence, with a bad family history and background, had long shown neuroticism and instability. Eight months before her admission she was in hospital for five to six weeks with a fractured skull. There was no evidence that this had any bearing on her present illness, that of a reactive depression in an hysterical personality.

(b) Cases with more intractable personality disorder.

CASE 25.—Female, aged 16. This patient had a very bad family history and an equally bad home. From the age of nine she had become increasingly unstable in her behaviour. At 14 she sustained a severe head injury, and following this her behaviour became markedly worse. She showed an epileptic record in an EEG, and signs of organic deterioration. Her injury was important in increasing and perpetuating a pattern of behaviour that was already present.

CASE 27.—Male, aged 17. There was again a bad family and home, and he had long shown neurotic traits, and was backward and delicate. Six months ago he was in hospital for a month with an illness suggestive of encephalitis. Following this he became difficult and aggressive to his mother. In hospital he showed no abnormal behaviour, but his EEG suggested cortical dysrhythmia. It appeared that his illness and other psychogenic factors contributed to his behaviour disorder, and long-term observation will be necessary to assess this case.

CASE 28.—Male, aged 14. This patient had a bad family history and home, and early showed neurotic traits. There was much ill-health, and at five he appeared to have had definite encephalitis. From then on he was mischievous,

unstable, and repeatedly committed arson. He was mentally backward, physically underweight, but an EEG was normal. The history of encephalitis needed to be weighed against other important psychogenic factors.

Psychotic Group.

CASE 42.—Male, aged 17. This patient had an unstable alcoholic father, but after his desertion the family background was stable. He had neurotic traits, missed school because of ill-health, and was scholastically backward. Two years ago he had sustained a head injury and was unconscious for two days. His recent development of schizophrenia had no apparent relationship with this.

(2) *Patients with a history of some organic disease of the central nervous system of importance other than in Group (1).*

Non-Psychotic Group.

CASE 2.—Female, aged 16. This child, whose father died, was subsequently spoilt by her mother. She showed long-standing emotional and personality difficulties, and was seduced at the age of ten. For several years she had weakness of the hands and feet (cerebral agnosia), which handicapped her in that she could not play games. Although of superior intelligence she failed scholastically, probably from discouragement over her handicap. A number of factors, including this, led to her abnormal behaviour.

Psychotic Group.

CASE 49.—Male, aged 15. This patient had Friedreich's ataxia, and he was sensitive of his disabilities. At 15 he developed a paranoid psychosis. He also had epileptiform attacks and a grossly abnormal EEG. His physical state appeared to be of primary importance, but other factors included a direct family history of psychotic depression.

(3) *Patients with severe physical disease of other systems.* (This only occurred in non-psychotic cases.)

CASE 7.—Female, aged 15. This patient had a long-standing generalized eczema, which first occurred in babyhood. Her father died when she was four, and subsequently she did not get on well with her mother. Her eczema recurred from ten onwards, particularly when upset with her mother. She became depressed reactively to this situation.

CASE 14.—Female, aged 13. There was an unstable background, and she was neurotic and hypochondriacal from an early age. With this went repeated physical ill-health, which materially contributed to her present neurotic illness and invalidism.

CASE 18.—Male, aged 18. This patient had a severe anxiety state following a long history of neuroticism and an unstable background. At 15 a duodenal ulcer was diagnosed by X-rays. He stayed at home for nine months and this increased his introspection and anxiety.

CASE 20.—Male, aged 17. At four years this patient had an empyema following measles, followed by abscesses and operations requiring a year's hospitalization. He was immature and of poor physique. He was much spoilt, and this combination of factors appeared to be important in leading to stealing, for which he was admitted.

CASE 23.—Male, aged 17. Here there was a history of recurrent bronchitis in childhood, and overprotection by his mother. These factors, however, appeared unimportant in comparison with the many others that contributed to his anxiety state.

CASE 28 was considered in connection with his history of encephalitis (see page 597).

The incidence of physical disorders in these patients is given in Table III.

Analysis of Table III.—The incidence is small compared with that of other factors. The chi-square test shows no significant difference between the

TABLE III.—*Serious Physical Illness in the Past or Present.*

	Totals.	(1) Enceph.; Head injury, meningitis.	(2) Other diseases of C.N.S.	(3) Diseases of other systems.
<i>Non-psychotic Cases.</i>				
Girls .	16	3	1	3
Boys .	15	2	—	3
Total .	31	5	1	6
Percentage ..		16.1%	3.2%	19.3%
<i>Psychotic Cases.</i>				
Girls .	8	—	—	—
Boys .	11	1	1	—
Total .	19	1	1	—
Percentage ..		5.3%	5.3%	..

non-psychotic and psychotic groups, nor between the sexes. A history of encephalitis or head injury was higher in the small group with severe personality disorders. General systemic disease was highest in psychoneurotics, and clinically physical disease appeared to favour neuroticism, hypochondriasis or over-solicitude by the parents.

Personality.

In the consideration of personality at this age temperamental traits can be seen to stand out from the earliest days of life and thus seem to be innate; but grafted on to these are other qualities that are reactive to the circumstances of the child's life. The individual's personality, especially in these early years, is modifiable to some extent, and can be changed for good or evil by the various environmental influences that may be met.

This modifiability is important in childhood and adolescence, and Lewis (10) points out that each patient's personality is not only to be assessed as conforming to a frozen artificial type, but as a complex of dynamic functions, changing in outward form, sometimes in unstable equilibrium. In the assessment of adolescent personality this would seem to be fundamental, and due care should be taken to allow for such instability. It is well shown in Case 3, a girl of 16, who was regarded as having a normal outgoing personality until her mother died when she was 11. From then on, it seems as a result of this and her home circumstances, she became seclusive, with mild suspicion of her family and an increasing behaviour disorder. It is a matter of conjecture what an estimate of her personality would be, should this behaviour continue into adulthood. Again, Case 14 was a girl who had been described as happy, but with repeated ill-health and anxious care by her mother developed into an hypochondriacal, anxious, and in some ways hysterical individual. By adolescence these traits had become almost intractable features of her make-up.

It is generally held that abnormalities of personality are often found in those who subsequently become psychotic, and this is equally so in adolescence as in later years. The examination of the previous personalities of these cases,

allowing for their still plastic nature, shows firstly a high proportion who had morbid traits dating back to childhood; and secondly, such traits were diverse, bearing out the individuality of each character, and the difficulties of classification into definite types except within broad limits.

As regards the first, without comparison with the normal population it is impossible to state that this high proportion of abnormality is significant; but it is suggestive and therefore reasonable to state that the presence of mental illness and abnormal behaviour in adolescence is associated in these cases at least with a previously high proportion of abnormal traits of personality, which are marked enough to be noted by relatives.

As to the second, individual personalities are evasive, and it was necessary to confine their estimation to certain broad and well-defined groups of traits, which recurred in their histories. This led to the following groupings, which were distinguishable enough to be reasonably accurate for quantitative assessment:

(1) Children who were regarded as having normal personalities—able to “exteriorize” themselves, to make friends, to mix and hold their own. They were not always free from bad traits, but such traits were not so marked as to be morbid.

(2) Children who had morbid traits sufficient to mark the patient as abnormal:

(a) Shut-in personalities, with shyness, solitariness, sensitiveness, overdependence or day-dreaming.

(b) Aggressive, quick-tempered, rebellious or resentful personalities.

(c) An indeterminate group, which did not fit into the above categories. They included those who were “difficult or unstable,” denoting an ill-defined lack of dependability or changeableness. There were other traits, and for instance Case 29 stood out alone for indifference, lack of affection, callousness, and a capacity for cruelty.

There was no hard and fast dividing line between such artificial groups, and in some cases it was not easy to decide in which group the patient should be placed. It was, however, possible to tabulate them as shown in Table IV.

TABLE IV.—*The Personalities of these Patients.*

	Totals.	(1) Normal personality.	(2) Ab. personality.	“Shut-in.”	Aggressive.	Inde- terminate.
<i>Non-psychotic Cases.</i>						
Girls .	16	7	9	3	3	3
Boys .	15	2	13	8	1	4
Total .	31	9	22	11	4	7
Percentage ..		29%	71%	35.5%	12.9%	22.6%
<i>Psychotic Cases.</i>						
Girls .	8	5	3	3	—	—
Boys .	11	2	9	7	—	2
Total .	19	7	12	10	—	2
Percentage ..		32.8%	63.1%	52.6%	..	10.5%

Analysis of Table IV.—This table, apart from the high total of children with abnormal personalities both among non-psychotics and psychotics, shows: (1) The "shut-in" type is relatively common among both non-psychotics and psychotics, and particularly in the latter. This was to be expected in those with schizophrenia (7 out of 15 cases of schizophrenia). (2) The number with abnormal personalities is higher amongst boys in both groups, although with such small numbers this cannot be considered significant. (3) Detailed examination—apart from schizophrenia—showed no particular type of personality disorder to be associated with any particular illness.

Intelligence.

The level of intelligence is important, and a low level may add to an adolescent's difficulties in adjusting to what is often a time of new responsibilities. Intelligence higher than the average may also bring its problems, so that deviations from the average may in some cases become an important aetiological factor.

These patients had whenever practicable their level of intelligence measured according to the needs of the case. To judge its significance as an aetiological factor the full case-history is required, but extracts are given where it was considered important.

Cases with low intelligence.

Non-Psychotic Group.

CASE 1.—Female, aged 15. This girl had an I.Q. of 77 per cent. (Stanford-Binet), and her performance at school was only average. On leaving school the jobs she attempted were beyond her, and she repeatedly absented herself. This appeared to contribute materially to her delinquencies and abnormal behaviour.

CASE 15.—Male, aged 14. Many factors contributed to his becoming a behaviour problem, but his I.Q. of 79 per cent. (Stanford-Binet) led to a lack of judgment in managing his affairs.

CASE 22.—Male, aged 14. An I.Q. of 74 per cent. (Mill Hill Vocabulary) fitted in with his timid personality, and contributed to his ill-judged aggressive behaviour that led to his admission.

Psychotic Group.

CASE 43.—Male, aged 15. This boy was mentally defective (I.Q. 56 per cent. Stanford-Binet, but with considerable scatter), and he developed an insidious hebephrenia superimposed upon it.

Cases with high intelligence.

Non-Psychotic Group.

CASE 9.—Female, aged 15½. This girl, with an I.Q. of 111 per cent. (Stanford-Binet), was taken away from school because of poverty, and had to lead a drab and monotonous life. Her vivid phantasy life and wandering away were considered partly due to her intelligence.

CASE 21.—Male, aged 17. This boy had dull and unsatisfying work; his I.Q. of 122 per cent. (Stanford-Binet) helped towards his neurotic illness in that he had no outlet for his adolescent idealism.

TABLE V.—*Intelligence Level Considered Important as an Aetiological Factor.*

<i>Non-psychotic Cases</i>		Low I.Q.		High I.Q.		Total.
Girls	.	1	.	1	.	2
Boys	.	2	.	1	.	3
Total	.	3	.	2	.	5
Percentage	.	9.7%	.	6.4%	.	16.1%

Psychotic Cases.

Girls	.	—	.	—	.	—
Boys	.	1	.	—	.	1
Total	.	1	.	—	.	1
Percentage	.	5.3%	.	..	.	5.3%

Analysis of Table V.—These cases showed a wide range of intelligence, and it was considered an important factor in a small number. The differences between non-psychotics and psychotics were not significant.

The Electro-encephalogram.

An electro-encephalogram is of interest in the aetiology and endowment of some cases, and an abnormal result might be expected to be of significance in accounting to some extent for the symptoms and abnormal behaviour shown by them. Such abnormal results were in high proportion where it was done, and were not confined to any particular type of case, except for the high incidence of epileptic activity amongst those with schizophrenia. This was in keeping with the previous work of Gibbs *et al.* (11), Jasper *et al.* (12) and Denis Hill (13).

TABLE VI.—*The Results of Electro-encephalography.*

	Total.		Normal EEG.		Abnormal EEG.		Not done.
Non-psychotic cases	31	.	6	.	11	.	14
Psychotic cases	19	.	2	.	10	.	7

Analysis of Table VI.—The types of abnormality shown were variable, from minor and doubtful abnormalities to those which were grossly abnormal, but it is to be noted that there were very few focal abnormalities or asymmetries, and these latter are the only certain evidence of acquired cortical dysfunction. Caution is necessary in the interpretation of these results; the age range of 14 to 17 is the age of "final maturation" in electro-encephalographic terms, which will decide the "stamp" or individual character. There is much individual variation, and minor degrees of abnormality are difficult to assess, owing to lack of information on the subject. This may account for a number of minor abnormalities amongst the non-psychotic group, although 30 per cent. of abnormalities are expected even amongst adults.

THE ENVIRONMENT OF THE PATIENT.

A number of environmental factors of varying importance could also be elicited besides those affecting endowment. These were divided into :

- (1) Those emotionally ill adapted to the patient.
- (2) Those physically ill adapted to the patient.

FACTORS EMOTIONALLY ILL ADAPTED TO THE PATIENT.

The most important of these factors were those involving the family circle.

The Family Circle.

The magnitude of this influence on the growing child has been stressed many times ; it is one of the corner-stones of child psychiatry and of much psychopathological theory. On the other hand, a mentally unstable or physically delicate child is likely to invite the over-protection or perhaps in some cases rejection by the parents. This makes the significance of such happenings difficult to assess, and the position is further complicated by the fact that psychiatric abnormalities in the parents tend to lead to disturbances in their influence on the child as well as being of generic importance. The material has been divided for statistical purposes into the following sections for consideration of the family relationships.

(a) *Disturbances of the maternal attitude.*—This included a number of different emotional disturbances likely to affect the child for ill. They included over-solicitude, rejection, or anxiety, bad temper or nagging by the mother. In practice it was difficult to distinguish between these terms, including such a possibility as over-compensation for rejection. It was therefore decided to group them for statistical purposes, and to leave their finer shades of meaning for the individual cases, where their psycho-pathological significance could be assessed with other factors.

(b) *Lack of maternal influence.*—Evidence for this traumatic happening was confined to clear-cut cases, where the mother had died, was divorced, or lived for long periods apart from the child. Ill-defined instances of neglectful behaviour were not included.

(c) *Disturbances of the paternal attitude.*—These were not so numerous, but they included also such behaviour as indifference, antagonism or actual brutality ; violent tempers or over-strict discipline.

(d) *Lack of paternal influence.*—The same reasons applied as in the mother, but in addition there were cases where the father was away for long periods on war service. There were also cases of illegitimacy, where the father was not known or had hardly come into the child's life.

(e) *Evidence of gross spoiling of the child.*—This has been included as a separate aetiological factor, as it has been considered a cause for difficulty in adjustment in adolescence, which clinically is fairly easily established. It implies over-indulgence in material things, and does not necessarily involve

emotional disturbance on the part of the parents, although in most cases emotional disturbance and over-indulgence went together.

(f) *The only child*.—This was included as a separate factor, as it has been regarded as a cause of difficulty in adolescence. Levy (14) considered it was likely to give rise to a behaviour problem, and Burt (15) cited it as one of the factors leading to delinquency. Other authors have failed to confirm this, and little direct clinical evidence was found in favour of it, although the total of only children was small.

(g) *Disturbances of the sibling relationship*.—This is to be expected in many homes without leading to mental disturbance, and it cannot be separated entirely from the difficulties that would be likely to result from the symptoms or behaviour shown by the patient. The sibling relationship has, however, been emphasized as important, and care was taken to ensure that the disturbed attitude of the other siblings was causal and not an effect.

(h) *Miscellaneous difficulties in the home*.—A number of disturbing and unsettling factors in the home, considered detrimental to the child or adolescent, included the presence of difficult or quarrelsome relatives, remarriage and step-parents, separation of the parents, or the presence of a mistress in the home.

(i) *Long evacuation, change of home, institutional upbringing, etc.*—This was common because of the war, and the ensuing break-up of homes and evacuation almost universal among London children of this age. There were also a number of children who had no settled homes, and who were brought up in institutions or other such disturbing conditions.

The results of all these factors are shown in Table VII.

TABLE VII.—*Factors in the Family Circle Emotionally Ill—adapted to the Patients.*

		a	b	c	d	e		g	h	
	Totals.	Maternal attitude disturbed.	Maternal influence lacking.	Paternal attitude disturbed.	Paternal influence lacking.	Grossly spoilt by parents.	Only child.	Sibling relationship disturbed.	Miscellaneous difficulties in the home.	Long evacuation; change of home; institutional upbringing, etc.
<i>Non-psychotic Cases</i>										
Girls . . .	16	11	3	9	6	4	1	5	8	12
Boys . . .	15	14	2	7	5	6	3	4	5	6
Total . . .	31	25	5	16	11	10	3	9	13	18
Percentage . . .		80.6	16.1	51.6	35.5	32.2	9.7	29.0	41.9	58.1
<i>Psychotic Cases.</i>										
Girls . . .	8	4	2	4	4	2	1	3	5	4
Boys . . .	11	7	3	4	4	4	3	1	4	4
Total . . .	19	11	5	8	8	6	4	4	9	8
Percentage . . .		57.9	26.3	42.1	42.1	31.6	21.1	21.1	43.4	42.1

Analysis of Table VII.—This shows a particularly high incidence in which the maternal attitude was either disturbed or her influence lacking, including all but one of the boys who developed a non-psychotic illness or showed

abnormal behaviour. In both sexes it occurred in all but four in the non-psychotic group, and in all but six in the psychotic group. It is difficult to discount the importance of this finding, and to a lesser extent the significance of the other findings as aetiological factors. It is also of interest that the chi-square test showed no significant difference between the non-psychotic and psychotic groups, nor between the sexes.

Psychic Traumata.

Psychic traumata were found at different ages in a number of cases, and they appeared to be of varying importance. It was considered unsound to try to divide them into such kinds as sexual, emotional or physical traumata. A sexual assault may have great emotional significance; the realization by a patient of illegitimacy on the other hand is an emotional trauma with a strong sexual aspect. In one of the cases a boy was hit on the mouth by another, and the emotional significance of this far outweighed any physical hurt that occurred. There was little to be gained by such division, and the exact significance—balanced with other factors—could only be judged in the individual case.

These traumata occurred at varying times in the patients' lives, from early childhood up to adolescence. There is clinical evidence that events with a sexual significance that occurred in earlier years, although at first of little meaning to the patient, may become greatly enhanced when the sexual urges of puberty come about, and only then become a source of conflict.

The findings in this series are given below, and in those cases marked with an asterisk the trauma appeared to be the main precipitating factor in the subsequent illness:

Non-Psychotic Cases.

CASE 2.—Female, aged 16. She was seduced at the age of ten. Afterwards she began to stimulate herself sexually by means of her breasts, and one of the symptoms of her present illness was her marked sexual phantasy.

*CASE 3.—Female, aged 16. Her mother was killed in an air-raid when the patient was eleven, she being in the house when it was bombed. She was the youngest and favourite child, and it was following this her symptoms began.

*CASE 4.—Female, aged 13. Her grandmother, living in the home, died when she was ten. She had previously attended spiritualist *séances*, and in her present illness she believed her grandmother appeared to her. More important, she had lately gained the knowledge that her mother had associated with another man, and this was a source of much private grief.

CASE 5.—Female, aged 13. This child showed much anxiety, and possible fear over menstruation. It was found, as a possible factor, that she was discovered by boys changing a sanitary pad when camping.

*CASE 6.—Female, aged 16. This girl showed fear of the opposite sex. Her step-brother had seduced her when she was ten, and later she had discovered that her parents were unmarried when she was born. Her mother drank to excess.

CASE 8.—Female, aged 15. Her eldest brother died when she was 13, of bacterial endocarditis, in the house. Her present illness, which included hypochondriacal fears of heart disease, became more marked after this.

CASE 9.—Female, aged 15. This girl was seduced a few months before admission, and the main effect was that she felt she had lost some of her self-respect. She was admitted for truancy, but this had started before seduction.

CASE 12.—Female, aged 15. This child's mother died suddenly when she was six. She showed no overt disturbance after this. At ten she witnessed childbirth. She became a behaviour problem to which many factors contributed.

*CASE 13.—Female, aged 15. This girl felt disgusted after indulging in sexual play with boys. She was also worried as she had not menstruated. She had become antagonistic to her mother, and the latter was suddenly taken to hospital. Immediately after this her illness began with depression, and it seemed that her "death wishes" against her mother had been fulfilled.

CASE 15.—Male, aged 15. Although a long-standing behaviour problem, he was told at fourteen of his illegitimacy. He then refused to have anything further to do with his mother.

*CASE 17.—Male, aged 16. His present illness with anxiety symptoms immediately followed a punch on the mouth by a bigger boy.

*CASE 23.—Male, aged 17. This boy's father was psychotic, and at about the age of ten he witnessed, over a period, the father's excessive sexual demands of his mother. It was after this he rejected his parents—one of the prominent features of his disturbance.

Psychotic Cases.

CASE 33.—Female, aged 16. Her father died when she was three, and her loyalties were thereafter torn between her mother and grandmother. Her present psychotic illness began some months before she discovered her mother had been pregnant when unmarried. She was greatly upset, and later when staying with her mother her paranoid ideas increased.

CASE 35.—Female, aged 16. She had been exposed to drunken scenes at home in which her father hit her mother. This had no obvious connection with her illness.

CASE 38.—Female, aged 16. Her mother died when she was eight, and this had deeply upset her. She had also been buried in a rocket incident, although unhurt. There was no apparent relationship between her present illness and these events.

CASE 39.—Female, aged 15. Her father treated her mother with much brutality. Her grandmother, to whom she was much attached, died when she was twelve. There was again no apparent relationship between these and her illness.

*CASE 40.—Male, aged 14. His mother met a violent death when he was ten (? suicide), and he was made to kiss her bloodstained face. He became mentally abnormal for some weeks afterwards. His present illness followed a violent quarrel in which the grandparents accused his father of causing his wife's death.

CASE 44.—Male, aged 15. His mother died when he was eleven. Later he discovered his illegitimacy, and this knowledge showed itself in the content of his thoughts in the psychosis that then began.

TABLE VIII.—*Psychic Traumata.*

<i>Non-psychotic Cases.</i>	Total.	Total number of cases with psychic traumata.	Probable precipitating cause for illness.
Girls . . .	16	10	3
Boys . . .	15	3	2
Total . . .	31	13	5
Percentage . . .	..	41·9%	16·1%
<i>Psychotic Cases.</i>			
Girls . . .	8	4	—
Boys . . .	11	2	2
Total . . .	19	6	2
Percentage . . .	..	31·6%	10·5%

Analysis of Table VIII.—Emotional traumata occurred in a fairly high percentage and materially contributed to the aetiology, especially where the present illness followed such an event. There is no significant difference between the two groups nor the sexes. The number of girls was higher than the boys, and this may be partially due to the higher number of sexual incidents in girls.

New or Excessive Demands in Work or School in Adolescence.

In present social circumstances adolescence is a time when excessive demands may be made on the child. Until recently the school-leaving age was 14 for the majority, so that many children are plunged into work and need quickly to re-adjust themselves to a new and wider existence. This is at a time when the physiological and psychological changes of puberty are taking place. Young people not uncommonly have difficulty in settling down to a job, and in some frequent changes of work are noted. It is probable that many have had no chance to learn what work is likely to be suitable, and there is little or no opportunity of guidance perhaps by those qualified to advise them. This problem is inextricably mixed up with other stresses that arise from the circumstances and constitution of the young person; in their consideration it is not easy to isolate this aspect.

For the more fortunate children who do not leave school, there may be "cramming" for a scholarship, or a change to a less sheltered school where older and perhaps rougher children are to be met, or perhaps a boarding-school for those who hitherto lived at home. All such changes test the robustness and adaptability of the young adolescent, and if he or she is unsuitable for the new regime because of personality or intelligence, then stress is likely to be incurred.

These stresses were not uncommonly woven in with other causes, and they appeared to be of varying importance, and in two non-psychotics the main precipitating factor. These two cases are marked with an asterisk. Some of the others have already been described in reference to other factors.

Non-Psychotic Cases.

*CASE 1.—Female, aged 15. This girl was duller than the rest of her family, with an I.Q. of 77 per cent. At school she just held her own, but on leaving her parents found her a job with an electrical engineer, which proved beyond her. She became delinquent and began to run away, and through this lost further jobs.

CASE 2.—Female, aged 16. Amongst other important factors she had weakness and inco-ordination of the hands and feet. Although of high intelligence, she could not play games at school, found herself at a disadvantage, and her work then began to deteriorate.

CASE 8.—Female, aged 15. This girl, of shy and sensitive personality, and with a poor health record, started work at 14 in a shoe factory. She left it as she could not stand the noise. Subsequently as a sales assistant at Woolworth's she was over-conscientious, always scrubbing and cleaning.

*CASE 9.—Female, aged 15½. She did well at school, but had to leave at 14 and earn. She could not take the office job advised by the school, and started as a packer for higher wages. She did not settle, and truanting began.

CASE 17.—Male, aged 16. This overprotected boy left school at 14 after a normal school record, failed to settle and left his job as it was dirty and monotonous. This was a factor in the development of anxiety symptoms.

CASE 18.—Male, aged 18. This youth, on his father's insistence, was sent to a technical school at 14 to study structural engineering. Several attempts to leave were discouraged. He developed a "duodenal ulcer" and stayed at home for nine months. Further jobs were unsatisfactory. Many other factors with this contributed to an anxiety state.

CASE 19.—Male, aged 17. On leaving a village school at 14 he cycled daily a long distance to work which he disliked, and further stress was added by study and evening classes. His illness consisted of compulsive tics.

CASE 21.—Male, aged 17. This difficult and unstable boy much disliked his work as an audit clerk for its monotony, although he gave satisfaction. His lack of outlet for his adolescent idealism was considered an important factor in his breakdown.

Psychotic Cases.

CASE 41.—Male, aged 14. An Indian boy of "shut-in" personality, he was educationally backward and bullied at school (I.Q. 101 per cent.) From eleven to thirteen he had private tuition, and on return to school he was even further behind. Soon after this he developed schizophrenia.

TABLE IX.—*New or Excessive Demands in Work or School.*

<i>Non-psychotic Cases.</i>	Total.	Evidence of stress caused thereby.	Considered the precipitating factor.
Girls . . .	16	4	2
Boys . . .	15	4	—
Total . . .	31	8	2
Percentage . . .	..	25.5%	6.4%

Psychotic Cases.

Girls . . .	8	—	—
Boys . . .	11	1	—
Total . . .	19	1	—
Percentage . . .	..	5.3%	..

Analysis of Table IX.—These results are appreciable, but are not considered of any statistical significance as between the non-psychotic and psychotic groups, nor between the sexes.

FACTORS PHYSICALLY ILL-ADAPTED TO THE PATIENT.

Physical factors harmful to the child's growth and upbringing, which could exert a baneful influence on physiological and psychological development in adolescence, would be important. Evidence sought included malnutrition, poverty, and an overcrowded house or bad neighbourhood. Malnutrition either in the past or present was not evident in a single case, although in Case 5 there had been a possible history of underfeeding when evacuated. This absence of malnutrition was probably due to the better financial and nutritional state of the poorer sections of the community in the last few years.

Poverty was evident in several cases, and overcrowded, neglected or bleak homes were inevitably not uncommon under recent conditions. A drab, slum neighbourhood was found with some London children. Such were termed physically ill-adapted because of the effects they could have on bodily well-

being. However, although noted in several, there was no positive evidence of physical harm. Emotional ill-effects were apparent in two cases, so that in practice they cannot be separated from the aetiological factors of emotional importance.

The two cases were as follows :

CASE 9.—Female, aged 15½. This girl, of good intelligence (I.Q. 110 per cent.), living in a poor home, drab neighbourhood and with a dull job, had no outlet for her intellectual and emotional desires.

CASE 21.—Male, aged 17. A similar case (I.Q. 122 per cent.), who was very aware of his poor surroundings, dull job and lack of outlets.

In both there were other factors, but they had come to need better conditions, perhaps because of their high intelligence level, and were frustrated. Others in equally bad surroundings showed no emotional disturbance.

TABLE X.—*Factors Physically Ill-adapted to the Patient.*

	Total.	Malnutrition.	Poverty.	Poor overcrowded homes or neighbourhood.
<i>Non-psychotic Cases.</i>				
Girls .	16	.	2	3
Boys .	15	.	—	2
Total .	31	.	2	5
Percentage ..		..	6·4%	16·1%
<i>Psychotic Cases.</i>				
Girls .	8	.	2	2
Boys .	11	.	—	—
Total .	19	.	2	2
Percentage ..		..	10·5%	10·5%

Analysis of Table X.—This includes the two cases where there was evidence of emotional disturbance. There is no significant difference between the non-psychotic and psychotic groups, nor between the sexes.

Summary of the Aetiological Factors.

The survey of aetiological factors covers a wide field. Isolation of each has in turn been an artificial process, and apt to give undue emphasis to one aspect or another. To present them as an inter-related whole, all having an influence in the production of the mental illness or abnormal behaviour in these adolescents, they are shown in a collective table.

These figures cannot be compared with a normal control group, but the application of the chi-square test shows no significant differences within the group, either between the non-psychotic and psychotic groups, or between the sexes. This may be due to the small total of cases. The whole group has a heterogeneous background, in which a number of influences have helped to bring about a breakdown in adolescence. They have never appeared alone,

TABLE XI.—*Aetiological Factors.*

	Endowment.					Environment.																
	Family history.			Factors in patient.					Factors emotionally ill-adapted.												Physically.	
	Totals.	Psychosis, epilepsy, etc., in near relatives.	Neurosis, etc., in near relations.	Enceph.; head injury; meningitis.	Other diseases of C.N.S.	Severe physical disease.	Abnormal personality.	Intelligence level important.	Mat. att. disturbed.	Mat. inf. lacking.	Pat. att. disturbed.	Pat. inf. lacking.	Spoilt by parents.	Only child.	Sibling relat. disturbed.	Miscellaneous difficulties at home.	Long evacuation; changes at home, etc.	Psychic traumata.	New or excess demands in work, school.	Poverty.	Bad home or neighbourhood.	
Non-psychotic cases	31	15	18	5	1	6	22	5	25	5	16	11	10	3	9	13	18	13	8	2	5	
Percentage	..	48.4	58.1	16.1	3.2	19.3	70.9	16.1	80.6	16.1	51.6	35.5	32.2	9.7	29.0	41.9	58.1	41.9	25.5	6.4	16.1	
Psychotic cases	19	10	13	1	1	1	12	1	11	5	8	8	6	4	4	9	8	6	1	2	2	
Percentage	..	52.6	68.4	5.3	5.3	..	63.1	5.3	57.9	26.3	42.1	42.1	31.6	21.0	21.0	47.4	42.1	31.6	5.3	10.5	10.5	
Total number of cases	50	25	31	6	2	6	34	6	36	10	24	19	16	7	13	22	26	19	9	4	7	
Percentage	..	50.0	62.0	12.0	4.0	12.0	68.0	12.0	72.0	20.0	48.0	38.0	32.0	14.0	26.0	44.0	52.0	38.0	18.0	8.0	14.0	

although some stand out in frequency, notably the maternal and paternal relationship with the child, and the abnormalities of previous personality. Various factors have on clinical grounds been regarded as precipitating the present illness. However, the chief feature is the diverse nature of the aetiology apart from adolescence itself.

SYMPTOMATOLOGY.

The symptoms complained of by these patients were diverse. They are not a selected group except for their ages, and they show a wide range of problems and illnesses, so that this was expected.

Young children suffering from emotional disturbances show certain patterns or groups of symptoms which are characteristic of childhood. They tend to cover a definite if limited range, and are repeatedly seen whatever the disturbing factors. They comprise functional disturbances of various systems; more definite psycho-neurotic traits; disturbances in relationship with family, environment or conduct, and so on. They are relatively facile compared with the symptoms shown by adults, quickly arise as a reaction to environmental difficulties, and with increasing emotional disturbance tend to increase and spread until perhaps a "total reaction" occurs. With appropriate treatment they may disappear as quickly, contrary to those of adulthood. In older children more definite neurotic syndromes appear until about puberty, when they are more adult than childish in pattern, although often still retaining their more facile quality.

Adults with psychiatric problems, including the psychoses, commonly reveal neurotic traits in childhood. Their confirmation is not easy, and it is not possible to correlate one with the other. Many stable adults probably had such traits or *vice versa*, although if present they pointed to the presence of emotional disturbance at that time.

Adolescents allow a clearer picture to be seen, as relatives are reasonably reliable witnesses of such symptoms. In adolescent mental breakdown or abnormal behaviour they can still be recalled and examined in relation to this new development. These cases often had such symptoms, and they are important in clarifying and broadening the picture of the development of mental illness at this time. It is possible that they may be related in many cases, and that an unstable childhood may well lead into an unstable adolescence. The individual case-histories show best their relationship, and it is to some extent artificial to examine them apart from this setting. Nevertheless, such symptoms can be grouped without undue difficulty, to allow clarity of presentation and statistical analysis; and this includes the age of the patient at the onset of the present illness, the nature of the onset, and the relationship of the patient's age to that of physiological puberty. Adolescent disorders cannot be isolated from these, or from their previous symptoms. A clear picture can only be seen in relationship with the whole life-setting.

The psychoses and organic mental conditions, contrary to the functional disturbances, imply a new and more ominous range of symptoms at any age, more permanent and less tractable in quality. These cases included a small

number with organic disease of the central nervous system dating back into childhood of important aetiological significance. Such organic symptoms cannot well be separated from those of emotional significance; but in these cases they occurred only at the beginning of or during the present illness. Similarly, psychotic patients, with one exception, all developed their illness at or after puberty. In some non-psychotic cases the onset of the present illness could not clearly be separated from the disturbances of the past. In a few the present illness was almost lifelong, with a gradual and continuous evolution up to adolescence. In cases of doubt as to the onset, it was in fact always prior to puberty. These relationships are shown in Table XII, and for this purpose the following items are used:

1. The age of admission to hospital.
2. The age of menarche in girls.
3. The approximate age at which the present illness or abnormal behaviour is believed to have begun.
4. The presence of physical immaturity in relation to age.
5. The presence of emotional immaturity in relation to age.
6. The presence of symptoms of emotional disturbance dating back into childhood prior to the present illness.
7. The type of onset of the present illness: Sudden (S), Quick (Q), Gradual (G), "Lifelong" (L).

TABLE XII.—*Details of the Onset of the Present Mental Breakdown or Abnormal Behaviour in Relationship to the Age of the Patient, Physiological Puberty, and the Past History.*

	Case No.	Sex.	Age in years on admission to hospital.	Age in years of menarche in girls.	Age in years at onset of present illness.	Evidence of physical immaturity.	Evidence of emotional immaturity.	Evidence of emotional disturbance prior to the present illness.	Type of onset: S. = Sudden, Q. = Quick, G. = Gradual, L. = Lifelong.
Non-psychotic Group: Psycho-neurotic Cases.	1	F.	15	13	14	..	..	+	G.
	2	F.	16	+	14	..	..	+	G.
	3	F.	16	12	11	..	..	—	G.
	4	F.	13	12	12½	..	..	—	G.
	5	F.	13½	13	12	..	..	+	G.
	6	F.	16	12	15	..	+	—	S.
	7	F.	15	+	10	..	..	—	G.
	8	F.	15	+	12	..	..	+	G.
	9	F.	15½	13	15	..	..	+	G.
	10	F.	17	15	B.P.	+	+	+	G.
	11	F.	17	+	14	..	..	+	G.
	12	F.	15	13	<11	..	..	+	G.
	13	F.	15	15	15	+	+	+	S.

B.P. = Before puberty.

TABLE XII—(continued).

	Case No.	Sex.	Age in years on admission to hospital.	Age in years of menarche in girls.	Age in years at onset of present illness.	Evidence of physical immaturity.	Evidence of emotional immaturity.	Evidence of emotional disturbance prior to the present illness.	Type of onset: S. = Sudden. Q. = Quick. G. = Gradual. L. = Lifelong.
<i>Non-psychotic Group.</i>	14	F.	13 $\frac{1}{2}$	12 $\frac{1}{2}$	<11.	..	+	+	G.
	15	M.	14	—	11	..	..	+	G.
	16	M.	14	—	12	..	..	+	S.
	17	M.	16	—	15	..	+	+	S.
	18	M.	18	—	14	..	..	+	G.
	19	M.	17	—	10	..	..	+	G.
	20	M.	17	—	15	+	+	+	G.
	21	M.	17	—	14	..	..	+	G.
	22	M.	14	—	B.P.	+	+	+	G.
	23	M.	17	—	10	..	+	+	G.
	24	M.	16	—	12	+	..	+	G.
<i>Cases with severe personality disorder, or sequelae of organic disease of C.N.S.</i>	25	F.	16	13	9	..	..	—	G.
	26	F.	17	+	B.P.	..	..	—	G.
	27	M.	17	—	16 $\frac{1}{2}$	..	..	+	Q.
	28	M.	14	—	<5	+	..	+	L.
	29	M.	17	—	<5	+	..	—	L.
	30	M.	15	—	<5	..	..	—	L.
	31	M.	17	—	10	..	..	+	G.
<i>Psychotic Group.</i>	32	F.	15	14	15	..	..	+	S.
	33	F.	16	14	15	..	..	+	Q.
	34	F.	15	13 $\frac{1}{2}$	13 $\frac{1}{2}$	..	..	+	S.
	35	F.	16	13 $\frac{1}{2}$	15 $\frac{1}{2}$	..	..	+	S.
	36	F.	16	15 $\frac{1}{4}$	15 $\frac{3}{4}$	..	..	+	Q.
	37	F.	15	14	15	..	..	+	S.
	38	F.	16	14	15 $\frac{1}{2}$	..	+	+	G.
	39	F.	15	13 $\frac{1}{2}$	14	..	..	+	Q.
	40	M.	14	—	14	+	..	+	Q.
	41	M.	14	—	14	..	..	+	S.
	42	M.	17	—	17	..	..	+	S.
	43	M.	15	—	14 $\frac{1}{2}$	..	..	+	G.
	44	M.	15	—	14 $\frac{1}{2}$	..	..	+	S.
	45	M.	16	—	16	..	..	+	S.
	46	M.	14	—	B.P.	..	..	+	G.
	47	M.	18	—	14	..	..	+	G.
	48	M.	16	—	15 $\frac{1}{4}$	..	..	+	G.
	49	M.	17	—	8	+	..	—	G.
	50	M.	15	—	14 $\frac{1}{2}$	..	..	+	G.

B.P. = Before puberty.

Analysis of Table XII.—This shows the relationship of the present illness to puberty, and the presence, if any, of emotional disturbances in the past for each individual case. It also shows those cases with physical or emotional immaturity. For the purpose of analysis it is necessary to group them further in Table XIII.

TABLE XIII.—*The Onset of the Present Mental Breakdown or Abnormal Behaviour in Relationship to Puberty and Previous Emotional Disturbance.*

<i>Non-psychotic Group.</i> Total.			Onset of illness before puberty.	Onset of illness after puberty.	Evidence of emotional disturbance before present illness.	Incidence of types of onset.
Psycho-neurotic Cases.						
Girls	.	14	7	7	10	11G., 1Q., 2S.
Boys	.	10	6	4	10	8G., — 2S.
Total	.	24	13	11	20	19G., 1Q., 4S.
Percentage	.	..	54·2%	45·8%	83·3%	..

Severe personality disorders, or sequelae of organic disease of C.N.S.

Girls	.	2	2	—	—	2G.
Boys	.	5	4	1	—	3L., 1G., 1Q.
Total	.	7	6	1	3	3L., 3G., 1Q.
Percentage	.	..	85·7%	14·3%	43%	..

Psychotic Group.

Girls	.	8	—	8	8	1G., 3Q., 4S.
Boys	.	11	2	9	10	6G., 1Q., 4S.
Total	.	19	2	17	18	7G., 4Q., 8S.
Percentage	.	..	10·5%	89·5%	94·7%	..

L. = Lifelong. G. = Gradual. Q. = Quick. S. = Sudden.

Further Analysis of Tables XII and XIII.

1. All cases reached physiological puberty about the normal time except for the few boys who were physically immature, but who were evenly distributed throughout the series and not confined to any one group. Physically, such boys were at various stages of puberty.

2. Psycho-neuroses began before physiological puberty in 54·2 per cent., and after puberty in 45·8 per cent. In those with severe personality disorders or the sequelae of organic disease of the central nervous system, such illnesses began in 85·7 per cent. before puberty, and in only 14·3 per cent. afterwards. In contrast psychoses began before puberty in only 10·5 per cent., and after puberty in 89·5 per cent.

3. The onset was more frequently gradual in psycho-neuroses, often of very long standing in severe personality disorders, but more often of quick onset in psychoses.

The relationship of the onset of mental disturbance to puberty is of interest, and the chi-square test confirms a significant difference between the non-psychotic group, counting the psychoneuroses and personality disorders together, and the psychotic group. There is no significant difference between the sexes. This indicates that although neurotic illness often starts after physiological puberty, it is more likely to start before this epoch; psychotic illness, on the other hand, is far more likely to begin after puberty. (These aspects will be further discussed in the next section.)

4. The findings in regard to symptoms of emotional disturbance prior to the onset of the present illness appear to be significant. In the psycho-neurotic group they were found in 83.3 per cent.—only 4 out of 24 cases were free from such symptoms in varying degree prior to their illness. In those with severe personality disorders they occurred in 43 per cent., but all of this group were of very long standing, and those who were not of long standing all showed these symptoms. In psychotic cases they occurred in 94.7 per cent.

In all three groups these results form a high percentage, and although they cannot be compared with normal controls, they are of probable importance in relation to the onset of mental breakdown or abnormal behaviour showing in adolescence of whatever kind. The chi-square test confirms there is no significant difference between the non-psychotic and psychotic groups, nor between the sexes. Thus mental breakdown or abnormal behaviour in adolescence is likely to be preceded by symptoms of instability in childhood, and adolescence cannot be isolated with validity from those earlier years, either in the aetiological or symptomatological senses.

In view of this evidence of a high incidence of symptoms of emotional disturbances in the past, it was decided to consider the relationship between them and the symptoms of the present illness, and for this purpose they were placed in six groups. Some overlapping occurred, but as this applied equally to the emotional disturbances of childhood and to the illness showing in adolescence, it did not invalidate the findings.

These symptoms are listed in their groups, and will be followed by their tabulated incidence in the past history, and in the present mental breakdown or abnormal behaviour. They include both functional and organic symptoms.

List of Symptoms shown by these Patients.

(1) *Disorders of Function.*

(a) Disturbances of consciousness: Faints, epileptic fits, and hysterical disturbances of consciousness, including fugue states.

(b) Disturbances of the motor system: Hyperactivity, restlessness, fidgetiness, tics and choreiform movements. Also, on the other hand, motor retardation and slowness.

(c) Disturbances of appetite: Over-eating, lack of appetite, or faddiness.

(d) Disturbances of alimentation: Constipation or diarrhoea.

(e) Disturbances of micturition: Increased frequency without physical cause, enuresis.

(f) Disturbances of sleep: Difficulty in sleeping, or oversleeping.

(g) Gratification habits: Thumb-sucking or "rocking."

(h) Tension habits: Nail-biting, nail-picking.

(i) Assertive or aggressive habits: Temper tantrums, stubbornness, quick temper, breath-holding attacks, roughness, spitefulness.

(2) *Psychoneurotic Traits.*

(a) Anxiety: Expressed as fear, fright or nervousness, various phobias; the somatic symptoms thereof—dizziness, palpitations, choking, tenseness, agitation.

(b) Obsessional traits: Excessive guilt, troublesome conscience, over-conscientiousness, excessive cleaning or scrubbing. In the present illness there were various more definite obsessional symptoms.

(c) Hysterical traits: Symptoms or behaviour which were deemed purposeful in character.

(d) Hypochondriacal traits: Complaints and interest in physical disease in the absence of evidence for it.

(3) *Marked Emotional Attitudes.*

(a) Timid, shy, solitary attitudes. These were symptomatic as used here, but they have also been considered under personality.

(b) Aggressive or assertive attitudes, e.g. boisterousness.

(4) *Disturbed Family and Social Relationships.*

- | | |
|-------------------------|--|
| (a) Towards the mother. | { Aggressiveness, disobedience, unaffectionate behaviour, rejection, contemptuousness, demanding and domineering behaviour. On the other hand, overdependence, fear. |
| (b) " " father. | |
| (c) " " siblings. | |
| (d) Towards the school. | { Disobedience, aggressiveness, troublesomeness, truancy or delinquency. On the other hand, unhappiness, timidity, avoidance. |
| (e) " work. | |
| (f) " society. | |

(5) *Conduct Disorders.*

- (a) Lying.
- (b) Truancy or running away.
- (c) Stealing.
- (d) Disobedience or out of control.
- (e) Destructiveness.
- (f) Arson.
- (g) Excessive or perverted sexuality.

(6) *Miscellaneous Symptoms.*

A heterogeneous group, often more serious and less often functional in character, and seldom seen before the present illness began. They include symptoms of interest to the adolescent period, e.g. excessive phantasy or hypnagogic sensations. The main psychotic symptoms are grouped together, as they were too numerous to separate:

- (a) Depression: reactive to adequate stimuli or psychotic in character.
- (b) Elation or excitement: always serious in character.
- (c) Suicide: attempted or planned.
- (d) Depersonalization or unreality feelings.
- (e) Day-dreaming or excessive phantasy.
- (f) Hypnagogic sensations.
- (g) Ideas of reference.
- (h) Miscellaneous psychotic symptoms.

In Table XIV these symptoms have been divided into the non-psychotic and psychotic groups, and in both they are shown before and then during the present illness. The dates of onset of the illness were given in each case in Table XII.

Analysis of Table XIV.—A wide range of symptoms occurred in these cases in childhood, including disorders of function, psychoneurotic traits, "emotional attitudes," and disturbances of family and social relationships. Conduct disorders and those in the miscellaneous group are rare. They occur with

equal frequency in both the non-psychotic and psychotic groups, and the chi-square test shows no significant difference between them.

In disorders of function there is a significant difference between the sexes in both groups. This is confirmed by the chi-square test, and they are thus more common in boys than girls.

With the onset of the present illness these symptoms become more common in the non-psychotic group, and also "spread" to show conduct disorders. In the psychotic group they are replaced by the more ominous psychotic symptoms. In view of the different nature of the illness in the two groups they cannot be compared statistically, but between the sexes there is again a significant predominance of disorders of function amongst boys in non-psychotic cases.

ADOLESCENCE AS A FACTOR IN ABNORMAL BEHAVIOUR OR MENTAL BREAKDOWN AND THE ASSESSMENT OF ITS IMPORTANCE.

The study of physiological and psychological development reveals that emotional disturbances of varying severity may ensue in adolescence, although it is not clear how often they occur. As these cases were chosen for their temporal relationship to adolescence, such disturbances were to be expected whatever the nature of the illness from which they were suffering, or the many other independent factors that led up to it.

The intrinsic influences of development in adolescence are obscure at present, and there is no further means of assessing them than by clinical examination of the patient. It is highly probable that in many cases they are important, as shown by the rise in incidence of serious mental disorder at the age of sexual maturity.

Amongst these cases the date of menarche was known in most of the girls, and their degree of sexual maturity could be gauged from this. In boys the establishment of the date of puberty is uncertain. Some boys and girls, scattered throughout the series, were noted to be physically immature in relation to chronological age, although no obvious relationship to the illness from the physical point of view could be established from this. Emotional difficulties did, however, sometimes arise therefrom, and were detectable in such instances. Again, emotional immaturity was noted in some cases, mostly psycho-neurotics, and although not always coincident with physical immaturity, it seemed likely that the influence of physical development was closely bound up with it.

Tables XII and XIII on pages 612 and 614 showed the cases in which physical or emotional immaturity were noted, and they gave the ages at which the present illness began in its relationship to menarche in girls. Such needs to be examined in each individual, although in boys it must be in relation to the expected age of puberty. Thus the connection between physical maturity and the mental breakdown or abnormal behaviour can be determined, although it needs to be remembered that the prepubertal physical changes have started two or three years before. It is only below the age of 11 perhaps that this important intrinsic factor can be ruled out of the aetiology, and even in an illness beginning before this age it will in due course come to play its part.

TABLE XIV.—*Table of Symptomatology.*

	Disorders of function.										Psychoneurotic traits.			Marked emotional attitude.		Disturbances of family and social relationships.					
	1 Disturbance of consciousness.	2 Disturbance of motor system.	3 Disturbance of appetite.	4 Disturbance of attention.	5 Disturbance of micturition.	6 Disturbance of sleep.	7 Gratuit. habits.	8 Tension habits.	9 Ass. aggr. habits.	10 Anxiety.	11 Obsessional.	12 Hysterical.	13 Hypochondriacal.	14 Timid, shy, etc.	15 Aggr., etc.	16 To mother.	17 To father.	18 To siblings.	19 To school.	20 To work.	21 To society.
Non-psychotic Group (Total, 31 cases).																					
Symptoms before present illness.																					
Girls	.	.	.	.	.	.	.	.	.	4	1	2	1	4	4	8	2	3	4	2	1
Boys	.	.	.	.	.	.	.	.	.	6	4	1	1	6	1	8	2	4	7	3	—
Total	.	.	.	.	.	.	.	.	.	10	5	3	2	10	5	16	4	7	11	5	—
Percentage	.	.	.	.	.	.	.	.	.	32.3	16.1	9.7	6.4	32.3	16.1	51.6	12.9	22.6	35.5	16.1	3.2
Symptoms of present illness.																					
Girls	.	.	.	.	.	.	.	.	.	8	2	6	2	1	6	12	7	9	6	8	2
Boys	.	.	.	.	.	.	.	.	.	8	4	2	2	2	6	8	3	4	4	10	5
Total	.	.	.	.	.	.	.	.	.	16	6	8	4	3	12	21	10	13	10	18	7
Percentage	.	.	.	.	.	.	.	.	.	51.6	19.3	25.8	19.9	9.7	38.7	67.7	32.3	41.9	32.3	58.1	22.6
Psychotic Group (Total, 19 cases).																					
Symptoms before present illness.																					
Girls	.	.	.	.	.	.	.	.	.	2	—	—	—	2	—	4	2	2	2	1	—
Boys	.	.	.	.	.	.	.	.	.	3	—	—	—	7	1	2	1	1	3	—	1
Total	.	.	.	.	.	.	.	.	.	5	—	—	—	9	1	6	3	3	5	1	1
Percentage	.	.	.	.	.	.	.	.	.	26.3	—	—	—	47.4	5.3	31.6	15.8	15.8	26.3	5.3	5.3
Symptoms of present illness.																					
Girls	.	.	.	.	.	.	.	.	.	5	—	—	—	—	1	2	2	1	1	4	3
Boys	.	.	.	.	.	.	.	.	.	4	3	—	—	2	1	3	3	—	4	3	1
Total	.	.	.	.	.	.	.	.	.	9	3	—	—	2	2	5	5	1	5	7	4
Percentage	.	.	.	.	.	.	.	.	.	29.0	15.8	—	—	10.5	10.5	26.3	26.3	5.3	26.3	36.8	21.0

It was seen that in psychoneurotic cases the present illness began before physiological puberty in 54·2 per cent., and after puberty in 45·8 per cent. Even so, in the majority of those occurring before puberty it began in what were the prepubertal years. Thus it is probable that adolescence must be counted an aetiological factor of definite if varying importance in a high proportion of this group.

In the smaller number of cases with severe personality disorders or the sequelae of organic disease of the central nervous system, the present illness began before puberty in 85·7 per cent. of cases and after puberty in only 14·3 per cent. Most of such illnesses dated from early childhood, and in these cases adolescence could not play a part until the later stages when adolescence supervened.

Amongst psychotic patients, on the other hand, the illness began before puberty in only 10·5 per cent., whereas it started in 89·5 per cent. after puberty. Thus it seems that physical maturity was an important factor in this group.

Apart from the effects that the changes of adolescence have on the illness in the aetiological sense, adolescent traits were expected to colour the illness at this age. Van der Horst has suggested that adolescent disturbances may have a special nature (4), and there is a body of literature describing the behaviour said to be characteristic of adolescence. It is therefore necessary to look for such traits, to assess how far they colour the symptoms, although how far such traits are normal or abnormal is not clear.

To do this it is necessary to isolate them—inevitably an artificial process—and they must lose some significance, as they are closely interwoven with the other symptoms. However, the following adolescent traits could be picked out mostly in non-psychotic cases :

(a) The onset or an increase of disturbance in relation to the parents or their substitutes (refs. 1, 16, 17, 18). This was expressed as aggression, indifference, rejection or, on the other hand, an increase in overdependence.

(b) The onset or an increase of disturbance in relation to the siblings (1, 16, 17, 18). This was always expressed as aggression.

(c) Evidence of increased independence, as shown in truancy, running away or being "out of control" (1, 16).

(d) Sexuality marked enough to be notable (1, 18, 19, 20). This was expressed overtly or in excessive phantasy, and included heterosexual behaviour, perversions or well-marked masturbation. On the other hand, fear or prudishness were noted.

(e) Homosexual interests or behaviour shown (18, 19, 20).

(f) Excessive anxiety over menstruation (18).

(g) Neglect of personal hygiene or appearance (18).

(h) Increased self-consciousness or introspection (1, 21).

(i) Excessive idealism, intellectualism, religious interests or phantasy (1, 22).

Each case was examined for their presence and their incidence determined where ascertainable, as shown in Table XV.

Analysis of Table XV.—These traits occurred with some frequency in all but three of the non-psychotic cases, although they varied from case to case

in frequency and in their degree. There was no significant difference between psycho-neurotics and those with severe personality disorders or the sequelae of organic disease of the central nervous system. There was also no significant difference between the sexes.

In the psychotic group they were much less in evidence, although some cases showed a sexual colouring or preoccupation. Those present usually occurred before the psychotic symptoms became severe, when they became hidden or replaced by the profound changes in behaviour that occurred. No conclusion could be drawn between the non-psychotic and psychotic groups in view of the differences in their illnesses, but the comparative lack of such traits in the latter was to be expected.

TABLE XV.—*Adolescent Traits shown by these Patients.*

	Case No.	Sex.	Onset or increase of disturbance to parents.	Onset or increase of disturbance to siblings.	Increased independence or overdependence.	Overt or phantased sexuality or fear thereof.	Homosexuality shown.	Excessive anxiety over men- struation.	Neglect of personal hygiene or appearance.	Increased self-consciousness and introspection.	Excessive idealism, etc.
<i>Non-psychotic Group.</i> Psycho-neurotic cases	1	F.	+	..	+	..	..	..	+	..	..
	2	F.	..	..	..	+	..	..	+	..	+
	3	F.	+	..	+	..	..	..	..	..	..
	4	F.	+	..	..	..	..	..	..	..	..
	5	F.	..	..	..	..	..	+	..	..	..
	6	F.	..	..	..	+	..	..	..	..	..
	7	F.	..	..	..	..	..	..	..	..	..
	8	F.	+	+	..	+	..	..	..	..	..
	9	F.	..	+	+	+	+	..	..	..	+
	10	F.	..	..	..	+	+	..	..	..	..
	11	F.	+	+	+	+	+	..	..	..	..
	12	F.	+	+	+	..	..	..	+	..	+
	13	F.	+	..	..	+	+	+	..	..	..
	14	F.	+	..	+	..	..	..	..	..	..
	15	M.	+	..	+	+	+	..	..	..	+
	16	M.	+	..	..	+	..	..	..	..	+
	17	M.	+	..	..	..	..	..	+	..	..
	18	M.	+	..	..	..	..	..	..	+	..
	19	M.	..	..	..	..	..	..	..	..	..
	20	M.	+	..	+	..	..	..	..	..	+
	21	M.	..	..	..	+	..	..	..	..	+
	22	M.	+	+	..	..	..	..	..	..	..
	23	M.	+	..	..	+	..	..	..	..	+
	24	M.	+	+	..	+	..	..	..	..	..
Total cases . . .	24	..	16	6	8	12	5	2F.	4	1	8
Percentage . . .	..	..	66·7	25	33·3	50·0	20·8		16·7	4·2	33·3
<i>Non-psychotic Group.</i>											
Severe personality disorders, etc.	25	F.	..	..	+	+	..	..	..	..	..
	26	F.	..	..	+	+	+	..	..	..	+
	27	M.	+	+	..	..	..	..	..	..	..
	28	M.	..	..	..	..	..	..	..	..	..
	29	M.	..	..	..	+	..	..	..	..	..
	30	M.	+	..	+	..	..	..	..	..	..
	31	M.	+	..	..	..	..	..	..	..	..
Total cases . . .	7	..	3	1	3	3	1	..	..	..	1
Percentage . . .	..	..	42·9	42·9	13·9	42·9	13·9	..	..	..	13·9

TABLE XV—(continued).

<i>Psychotic Group.</i>	Case No.	Sex.									
			Onset or increase of disturbance to parents.	Onset or increase of disturbance to siblings.	Increased independence or overdependence.	Overt or phantased sexuality or fear thereof.	Homosexuality shown.	Excessive anxiety over menstruation.	Neglect of personal hygiene or appearance.	Increased self-consciousness and introspection.	Excessive idealism, etc.
	32	F.	..	..	..	..	..	..	..	..	..
	33	F.	..	..	..	+	..	..	..	+	..
	34	F.	..	..	..	..	..	..	..	..	..
	35	F.	..	..	..	..	..	..	..	..	..
	36	F.	..	..	..	..	..	..	..	..	..
	37	F.	..	..	..	..	..	..	..	..	..
	38	F.	..	..	..	+	..	..	..	..	+
	39	F.	..	+	..	..	..	+	..	+	..
	40	M.	+	..	..	..	..	..	..	..	..
	41	..	..	..	..	..	..	..	..	..	..
	42	M.	..	..	..	..	..	..	..	..	..
	43	M.	..	..	..	..	..	..	..	..	..
	44	M.	..	..	..	+	..	..	..	..	..
	45	M.	..	..	..	..	..	..	..	..	..
	46	M.	+	..	..	+	+	..	..	..	..
	47	M.	..	..	..	+	..	..	..	..	..
	48	M.	..	..	..	..	..	..	..	..	..
	49	M.	+	..	..	+	..	..	..	..	..
	50	M.	..	..	..	..	..	..	..	..	..
Total cases . . .	19	..	3	1	..	6	1	1F.	..	2	1
Percentage . . .	..	..	15·8	5·3	..	31·6	5·3	..	..	10·5	5·3

It is to be noted that in non-psychotic cases an onset or increase of disturbances in relation to the parents and sexuality were the most common traits to be observed.

DISCUSSION OF THE RESULTS.

These patients have been examined in detail in regard to aetiology, for the symptoms that they showed both in childhood and in their present illness, and for the part played by adolescence in the aetiological and symptomatological senses. It now remains to bring them together to form a co-ordinated whole, and to attempt to balance their relative importance.

It was found in the aetiology of these cases, of both sexes and with non-psychotic or psychotic illnesses, there lay in nearly every instance a number of varying factors of constitutional and environmental importance. It was not possible to isolate any as of exclusive importance, although some were likely precipitants of the illness; but some aspects, such as disturbance or the lack of maternal influence, and the number with abnormalities in the previous personality, were very frequent. These equally applied to all types of cases, and statistical analysis confirmed the heterogeneous nature of the factors in the background. Their frequency and importance confirmed the views expressed by Finesinger (2) that the troubles of adolescence had their origin in the previous stage of development, and that they could not be considered separately from what had happened in earlier childhood.

The most striking finding of the symptomatology was the high incidence of emotional disturbance in varying degree in childhood and its relationship with the illness showing in adolescence. Such symptoms were closely interdependent on the aetiological background and arose out of it, and one needed to be considered with the other.

Other findings were that the functional disorders were more common in boys, and that emotional disorders increased and spread with the onset of the present illness in non-psychotic cases. In psychotics there was a change to a new range of psychotic symptoms. In addition, in non-psychotics the illness developed gradually more often than not, whereas in psychotics there was more often a quicker onset.

Adolescence itself was considered to be an important intrinsic factor, contributory in varying degree to most psycho-neurotic and psychotic illnesses, but much less in evidence in those cases with long-standing severe personality disorder, or the sequelae of organic disease of the central nervous system. This was based on the relationship of the illness to physiological puberty. Again in regard to the symptoms these patients showed, adolescent traits were found closely interwoven in a high proportion of non-psychotic cases, but they were in comparison lacking or hidden in those children with psychoses.

Adolescent mental disorders are very varied, and many factors both before and during adolescence intermingle and combine to form the whole picture. Their relative importance differs from case to case, but it is their combination that is decisive in leading to mental breakdown or abnormal behaviour. To view, therefore, this picture of the mental disturbances of adolescence in perspective, consideration of all these factors is required.

SUMMARY.

A group of 50 adolescents with mental disturbances was examined, including 24 cases with psycho-neurotic disorders, seven cases with severe personality disorders or the sequelae of organic disease of the central nervous system, and 19 cases suffering from psychoses.

They were examined in detail to determine their aetiology, what symptoms there were in their previous life and their relationship to the present illness; and finally, to what extent adolescence was causative to their illness or coloured it. Statistical methods were used where applicable.

The aetiology in all cases was found to be wide and variable, with a number of constitutional and environmental factors of importance. No special factor could be singled out except as a probable precipitant of the present illness. Certain factors, however, such as a disturbance or lack of maternal influence, or abnormalities of personality, were particularly frequent.

The symptoms were equally varied, and a high proportion of all cases showed symptoms of emotional disturbance in earlier childhood. The present illness was more often of gradual onset in non-psychotics, and appeared to evolve from the earlier disturbance of childhood by an increase and spread of the symptoms then shown. In psychotic cases the illness began quickly as a rule, and there was a change of symptoms to those characteristic of the psychosis.

Adolescence was considered to be an intrinsic factor of importance in most psycho-neuroses and psychoses. In cases with long-standing personality disorders or the sequelae of organic disease of the central nervous system it was not so apparent.

Finally, adolescent traits were found to colour the symptoms in most non-psychotics, but were much less evident in the psychoses.

REFERENCES.

- (1) SCHWAB, S. S., and VEEDER, B. S. (1929), *The Adolescent: His Conflicts and Escapes*. New York.
- (2) FINESINGER, J. E. (1944), *Psychiatry*, **7**, 45.
- (3) YELLOWLEES, H. (1939), *The Problem of Adolescence: Morison Lectures*. Edinburgh.
- (4) VAN DER HORST, L. (1938), *Psychiat. Neurol. Bl., Amst.*, **42**, 909.
- (5) KANNER, L. (1941), *Med. dis. N. Amer.*, **25**, 515.
- (6) BERES, D., *et al.* (1946), *Amer. J. Ortho-psychiat.*, **16**, 84.
- (7) CONKLIN, E. S. (1935), *Principles of Adolescent Psychology*. New York.
- (8) YEARBURY, E. C., and NEWALL, N. (1944), *Amer. J. Psychiat.*, **100**, 599.
- (9) FRIEDLANDER, D. (1945), *J. Abnorm. Psychol.*, **40**, 330.
- (10) LEWIS, AUBREY (1946), "Psychological Medicine, Section XX," from *A Textbook of the Practice of Medicine*, F. W. Price. Oxford Medical Publications.
- (11) GIBBS, F. A., *et al.* (1938), *Amer. J. Psychiat.*, **95**, 255.
- (12) JASPER, H. H., *et al.* (1939), *ibid.*, **95**, 835.
- (13) HILL, DENIS (1949), *The Relationship between Epilepsy and Schizophrenia—EEG Studies*. In the press.
- (14) LEVY, J. A. (1931), *Amer. J. Psychiat.*, **10**, 637.
- (15) BURT, C. (1934), *The Young Delinquent*. 4th edition. Univ. London Press.
- (16) WALBURG, L. R. (1945), *The Nervous Child*, **4**, 129.
- (17) MEYERS, C. E. (1946), *ibid.*, **5**, 251.
- (18) DEUTCH, H. (1946), *Psychology of Women*, Part I. Research Books, Ltd., London.
- (19) ELLIS, HAVELOCK (1887-1910), *Studies in the Psychology of Sex*, Vols. I and II. New York.
- (20) DAVIS, K. B. (1929), *Sex Factors in the Lives of Twenty-two Hundred Women*. New York.
- (21) FRANK, L. K. (1944), "The Adolescent and the Family," *Yearbook Nat. Soc. Stud. Educ.*, **43**, 247.
- (22) STANLEY-HALL, G. (1904), *Adolescence, its Psychology and its Relations to Physiology, Anthropology, Sociology, Sex, Crime, Religion and Education*; 2 volumes. New York.

This article has been abstracted from a thesis for the degree of M.D. at the University of Cambridge. The scheme used for aetiological and symptomatological classification was adapted from that introduced by Dr. Kenneth Cameron, Paediatric Physician, Maudsley Hospital, and in use in the Children's Department. My thanks are due to him, and to Dr. H. J. Eysenck, Senior Psychologist, who advised me on the statistical methods used.

ELECTRONARCOSIS IN THE TREATMENT OF SCHIZOPHRENIA.*

By LINFORD REES, M.D., B.Sc., M.R.C.P., D.P.M.,

Regional Adviser in Psychiatry, Wales and Monmouthshire.

ELECTRONARCOSIS was introduced as a new treatment of schizophrenia by Tietz and co-workers in 1946. They reported favourable results in a group of 47 schizophrenics and claimed that it was as effective as deep insulin therapy, in the treatment of schizophrenia.

Published reports on its therapeutic results in schizophrenia are not all in agreement. Spencer Paterson and Milligan (1948) support the claim of Tietz, whereas Garmany and Early (1948) found the treatment of little value. Medlicott (1947 and 1948) reported favourable results, particularly in early paranoid schizophrenics. The results of Bowman and Simon (1948) did not lead to definite conclusions except that it was considered equal to electroshock in the treatment of schizophrenia. Thus we are not as yet near the stage of reaching final agreement on the evaluation of electronarcosis in the treatment of schizophrenia.

In order to arrive at an accurate assessment of the value of electronarcosis in the treatment of schizophrenia we must know :

(1) Whether electronarcosis produces significantly better results in schizophrenia than routine hospital care.

Some people equate the results of routine hospital care with spontaneous remission rate, but this surely minimizes unduly the therapeutic value of general hospital care, occupational and recreational therapy.

(2) Whether the results are as good as or better than deep insulin therapy. If electronarcosis were found to be as good as deep insulin therapy there would be much to say in its favour, as it is simpler, easier to administer and less time-consuming.

(3) Finally we should know whether electronarcosis gives better results than the more easily administered electroconvulsive therapy.

There are many difficulties and obstacles in the way of an attempt to make a scientific assessment of any new method of treatment in psychiatry.

These difficulties are related to :

(1) Provision of satisfactory control groups.

(2) The fact that standards and criteria for diagnosis vary among different workers and hospitals, and that as yet we have no satisfactory objective methods of assessing diagnosis or clinical status in psychiatry.

(3) The fact that we have no objective methods of measuring recovery and the fact that varying standards and criteria are used in its assessment by different workers.

* Paper read at the Quarterly Meeting of the Royal Medico-Psychological Association, London, February 22, 1949.

It is on account of such difficulties that the therapeutic value of deep insulin in the treatment of schizophrenia remains controversial, even after more than twelve years' trial in this country.

The comparison of the results of treatment by different methods will be vitiated unless it can be ensured that :

(1) The groups are strictly comparable ; corresponding not only in age and sex distribution, but also in clinical status, and in tendency to spontaneous recovery.

(2) The assessment of recovery in all groups must be made by the same methods, using identical standards and criteria.

These prerequisites for scientific validation make it difficult to combine results from various hospitals because of varying criteria used in assessing clinical status and recovery.

The fulfilment of these desiderata means that the various groups studied should be assessed by the same standards, either by the same workers or by a group of workers, provided it can be shown that they exhibit a high degree of agreement in their ratings. These requirements tend to impose a limit in the size of the population studied.

The experimental population of this study consists of 160 schizophrenics, on whom 208 courses of treatment were given as follows :

39 patients treated by electronarcosis.

97 ,, ,, ,, deep insulin therapy.

72 ,, ,, ,, E.C.T.

Some patients were treated by more than one method, and in order to avoid inaccuracies every patient was assessed separately for each treatment. It was not considered safe to attribute recovery to a particular treatment if there was an interval of weeks or months after termination of treatment, as some workers have done. In this investigation only recovery or improvement occurring during or immediately following treatment is classed as attributable to the treatment, and even in these cases the possibility of coincidence with spontaneous remission has to be taken into account.

The majority of the patients were treated at Whitchurch Mental Hospital, Cardiff. A small series of electronarcosis patients were also studied at St. Cadoc's Hospital, Newport.

Electronarcosis was given by the technique described by Tietz (1946) and Spencer Paterson (1947), patients being given the treatment thrice weekly for four weeks. Second courses were given in some patients.

All patients participated in an active régime of occupational and recreational therapy.

Clinical status, degree of recovery and follow-up were in all cases assessed by the author.

Follow-up Assessment.

The assessment of follow-up was based on :

(1) Interviews with parents and relatives in hospital or at out-patient departments by the author. The majority of cases were so assessed.

- (2) Visits by social worker to interview relatives and patients (35 patients).
- (3) By letter (2 patients).
- (4) Untraced (5 patients).

Assessment of Clinical Status.

The use of the usual diagnostic categories as an assessment of clinical status was not considered suitable for scientific comparison because :

- (1) The diagnostic label is, at the best, an incomplete description of the clinical state.
- (2) Psychiatrists do not agree consistently enough in diagnostic categorization for scientific purposes.
- (3) Many cases do not fit readily into the usual categories.
- (4) Schizophrenics may change in predominant symptomatology during the course of the illness, e.g. coming at one time into the catatonic variety and later appearing as simple or hebephrenic types.

In order to overcome these disadvantages, and in order to use more objective procedures in the assessment of clinical status, the following techniques were used :

1. *Item sheet.*—An item sheet of some 300 items relating to social data, family history, personal history, personality and symptomatology was devised for the investigation and completed for each patient.

In addition to noting the presence or absence of symptoms, certain processes and dispositions were rated according to severity. Major components of schizophrenic mental status, such as introversion, intellectual, emotional and conduct disconnection and paranoid disposition in accordance with Mapother's (1927) description, were rated on a 7-point scale. Similarly, affective admixture, e.g. depression or excitement, hypochondriasis, etc., were rated on severity.

This method of recording enables a diagnosis to be made in terms of ratings of components of mental status, and can give a much more complete picture and assessment of mental status than the usual diagnostic label. It also provides a quantitative expression of mental status that can be used statistically.

The information on the item sheets were transferred to Hollerith punched cards, and the various analyses were carried out by a Hollerith counter sorter. In all some 500 separate analyses were carried out.

2. *Psychiatric rating scale.*—An extension of the above method was the use of a modification of the Psychiatric Rating Scale of the Worcester State Hospital. This method involves rating patients on 16 items relating to behaviour and mental state in terms of deviation from the normal. The sum of the ratings gives an abnormality index. This index, taken before, during and after treatment, gives a graphic and quantitative index of the degree of symptomatic improvement accompanying treatment.

The item sheet and rating scale together give a detailed standardized and quantitative assessment of clinical status.

In addition to these techniques, objective tests such as Rorschach, Thematic Apperception, the Wechsler Scale and Vigotsky's concept formation test were given to a number of the electronarcosis and insulin treated patients.

These tests, theoretically, could serve as objective methods of assessing clinical status, but as yet not enough data are available to attempt their use for this purpose.

Capacity for spontaneous recovery can be assessed by :

1. Clinical criteria.

2. Objective tests.

Most investigators on prognosis in schizophrenia agree that the following factors are of good prognostic significance. Short duration of illness, sudden onset, good previous personality, exogenic causation and atypicality.

Ideally, therefore, any treatment groups compared should correspond in the distribution of these prognostic factors.

Recent work has indicated that psychological tests like the Rorschach, Vigotsky's concept formation test may be prognostically valuable. A preliminary investigation using Piotrowsky's (1939) criteria on Rorschach responses failed to confirm his claim that the test can be used to forecast the therapeutic response to shock treatments. Piotrowsky had 88.8 per cent. success in forecasting the result of treatment.

Our results, both with electronarcosis and deep insulin groups, failed to support Piotrowsky's claims. In fact no statistically significant relationship was found between the forecast and result.

Electronarcosis (18) $\chi^2 = .21$. P between .50 and .7.

Insulin (21) $\chi^2 = .63$. P between .30 and .50.

Thus Piotrowsky's prognostic criteria with the Rorschach test cannot be safely used for assessing prognosis.

Before considering treatment results we should analyse the composition of the groups to ascertain how far they are comparable.

COMPARISON OF TREATMENT GROUPS IN AGE AND SEX DISTRIBUTION, HISTORY, AETIOLOGY AND SYMPTOMATOLOGY.

Sex.—The sex distribution in three groups is almost identical, M. 59 per cent., F. 41 per cent.

Age.—Distribution showed general similarity in the three groups with approximately 7 per cent. in 10–19 age group ; 62 per cent. in 20–29 age group ; 27 per cent. in 30–39 age group ; 4–5 per cent. in 40–49 age group.

Table I gives percentage distribution of items in the three groups.

Family history shows a close similarity in distribution of items relating to family history.

Previous mental health.—The differences are not statistically significant.

Personality.—Again the differences are not significant statistically.

Duration.—Under 1 year electronarcosis group has a significantly higher proportion (critical ratio = 2+).

Mental status.—This is shown in Table II. No significant differences are found in introversion, intellectual, emotional and conduct disconnection. High

TABLE I.—*Item Analysis.*

<i>Family History :</i>	Electronarcosis. %	Deep insulin. %	E.C.T. %
Negative	77	82	82
Psychosis	15	13	13
Epilepsy	2.5	2	0
Neurosis	8	2	7
<i>Previous Mental Health :</i>			
Normal	25	22	29
Clear predisposition	67	62	64
Definite illness	23	30	26
<i>Personality :</i>			
Stable	25	21	28
Very unstable and ill-adjusted	41	48	47
Broad interests	18	13	21
Very touchy or suspicious	36	40	36
Very schizoid	51	60	50
Cyclothymic	2.5	9	8
<i>Duration of Illness :</i>			
0-6 months	30	23	32
6-12 months	18	6	4
1-3 years	18	23	24
Over 3 years	33	46	40
<i>Onset of Illness :</i>			
Sudden	15	13	13
Prodromata, then acute	18	17	21
Gradual	64	68	67
<i>Aetiology :</i>			
Psychological causes important	15	13	14
Exogenous factors contributing	95	94	99
Mainly endogenous	17.5	16	16

paranoid disposition rating occurs in a significantly higher proportion in the electronarcosis group (C.R. = 2).

The insulin group has higher proportion of Simple and Hebephrenic types but the difference is not of statistical significance.

The groups therefore show a reasonable degree of correspondence with respect to history, aetiology and symptomatology. The significant differences being that the electronarcosis group has a higher proportion of patients with illness of less than one year's duration, and a higher proportion of patients

TABLE II.—*Mental Status.*

<i>Introversion Rating :</i>	Electronarcosis. %	Deep insulin. %	E.C.T. %
High (4+)	79	76	80
Low (0 - 2)	5	2	6
<i>Intellectual Disconnection Rating :</i>			
High (4 +)	78.5	74	80
Low (0 - 2)	2.5	5	6
<i>Emotional Disconnection Rating :</i>			
High (4 +)	70.5	76	74
Low (0 - 2)	10	8	11
<i>Conduct Disconnection Rating :</i>			
High (4+)	23.5	29	37
Low (0 - 2)	48	28	37
<i>Paranoid Disposition :</i>			
High (4 +)	53	35	35
Low (0 - 2)	28	37	34
<i>Depression Rating :</i>			
(2 +)	17.5	16	15
<i>Excitement (all ratings)</i>	5	7	3
<i>Clouding of consciousness</i>	15	6	9
<i>Intelligence Rating :</i>			
Below average	10	18	13
Average	69	59	61
Above average	21	20	24
<i>Diagnostic Subtype :</i>			
Simple and hebephrenic	59	74	63
Catatonic	15	15	21
Paranoid	25	10	14

with marked paranoid symptomatology. It will therefore be necessary for us to consider these items separately later.

ANALYSIS OF RESULTS.

The assessment of results was made :

(a) After cessation of treatment, usually 2-4 weeks afterward, (b) during follow-up investigation at periods of 6 months to 3 years.

(a) Immediate results were classified as :

(1) *Recovered*.—This indicated freedom from symptoms and signs, and assessed as probably being able to return to previous or equivalent employment.

(2) *Improved and discharged*.—Able to return to previous social environment in spite of presence of minor signs.

(3) *Improved, remaining in hospital*.

(4) *Not improved*.

(b) *Follow-up* results were graded as follows :

(1) *Total recovery*.—Freedom from symptoms and signs. Return to previous social environment and to previous or equivalent occupation.

(2) *Social recovery*.—Those able to return to same or equivalent occupation in spite of minor symptoms and signs.

(3) *Social defect*.—Presence of minor signs or symptoms with incapacity to carry out work of previous level and failure to maintain self in same degree of social adaptation.

(4) *Family invalids* were those patients with well marked symptoms and incapacity to carry out any useful occupation, but manageable at home.

(5) *Hospital invalid*.—Those relapsed and readmitted to hospital.

Table III gives the immediate results of treatment.

TABLE III.—*Immediate Results of Treatment.*

	Electronarcosis. %	Deep insulin. %	E.C.T. %
Recovered	8	29	8
Improved and discharged	23	30	24
Improved, remaining in hospital	20	1	10
Not improved	49	40	58

It will be seen that insulin has a considerably higher proportion of recoveries than electronarcosis and electroconvulsive therapy. The difference is highly significant statistically (CR above 3).

Relapse rate.

Table IV gives details on the relapses in the three treatment groups and one third of patients who were discharged as recovered or improved after electronarcosis, relapsed during the first year. 75 per cent. of the relapses occurred during the first six months. 23 per cent. of insulin patients discharged from hospital as recovered or improved relapsed. Again the majority of relapses took place during the first year.

In the deep insulin treatment group interesting differences occur between the relapse rate of recovered and improved groups. Only 7 per cent of the recovered group relapsed, compared with 38 per cent. of relapses in the improved group.

Thus not only does insulin treatment give a higher proportion of recoveries, but these recoveries are more lasting than those of E.C.T. and electronarcosis.

TABLE IV.—*Relapse Rate of Patients Discharged Recovered or Improved.*

Percentage of patients discharged re-	Electronarcosis.	Deep insulin.	E.C.T.
covered or improved	33	23	65
„ recovered patients	33	7	50
„ improved and discharged	33	38	71

Occurrence :

0-3 months	50	38	53
3-6 „	25	31	20
6-12 „	—	23	7
1-2 years	—	8	7
2-3 „	—	—	7
3 years +	—	—	7

The highest relapse rate is found in the E.C.T. group, again the improved group showing a higher relapse rate than recovered group.

Follow-up.

In addition to knowing the proportions relapsed we require to know more precise details of the outcome of those not relapsed. This is given in Table V.

It will be seen from Table V that the proportion of total recoveries has fallen from 8 per cent. to 5 per cent. in electronarcosis group, 29 per cent. to 27 per

TABLE V.—*Follow Up.*

	Electronarcosis	Deep insulin.	E.C.T.
	%	%	%
Total recovery	5	27	2
Social recovery	5	4	6
Social defect	0	5	2
Family invalid	10	10	4
Untraceable	0	3	0
Follow-up period	6-12 months	6 months-3 years	6 months-3 years

cent. in insulin group and 8 per cent. to 2 per cent. in the E.C.T. group. The proportion of social recoveries is very much the same in all groups.

Matched groups.

While the three groups correspond closely in clinical status, they were found to differ in one or two respects, viz. proportion of patients of illness less than one year's duration, and in paranoid symptomatology. A separate analysis in respect of these items is therefore indicated, and special investigation of the paranoid patients is also desirable in view of Medlicott's (1948) conclusion that paranoid schizophrenics respond particularly well to electro-narcosis.

Illness Less than One Year's Duration.

Table VI shows the treatment results of those patients with an illness of less than one year's duration. The results show that in groups matched

TABLE VI.—*Duration of Illness Less than One Year.*

	Electronarcosis. (19) %	Deep insulin. (29) %	E.C.T. (26) %
Recovered	16	55	15
Improved and discharged	16	21	23
Improved, remaining in hospital	31	0	4
No improvement	37	24	58

in this way insulin has an even larger proportion of recoveries than electro-narcosis and E.C.T.

Patients with Marked Paranoid Symptomatology.

Table VII shows the treatment results in patients with marked paranoid symptomatology.

TABLE VII.—*Groups with Marked Paranoid Symptomatology.*

	Electronarcosis. (21) %	Deep insulin. (34) %	E.C.T. (25) %
Recovered	5	38	12
Improved and discharged	28	26	28
Improved, remaining in hospital.	28	3	4
Not improved	38	35	56

Insulin treatment again shows the highest proportion of recoveries, and results lend no support to Medlicott's contention that paranoid schizophrenics respond particularly well to electronarcosis therapy.

The treatment results show a consistent trend in all analyses so far, and the separate analysis of the two items in which the groups differed significantly in fact enhanced the results obtained with insulin therapy.

In order to try to satisfy statisticians fully, we should ensure that the groups compared should be deliberately and accurately matched in the main prognostic factors as well as in mental status. This process cannot be taken very far without having an unlimited number of cases to draw upon as the resultant accurately matched groups would be too small.

Patients of Good Prognosis.

Table VIII gives the treatment results with patients of good prognosis. In these patients the duration of illness was less than one year and of sudden onset with good previous personality.

TABLE VIII.—*Good Prognosis Groups. Illness Less than One Year, Sudden Onset and Good Previous Personality.*

	Electronarcosis. (6) %	Deep insulin. (11) %	E.C.T. (12) %
Recovered	33	72	8
Improved and discharged	0	9	33
Improved, remaining in hospital	67	0	0
Not improved	0	18	58

These groups were analysed for mental status and corresponded closely. They are the nearest we can get to identical groups. The groups, inevitably, are small, but it will be noted that the favourable results with insulin are not only confirmed but further enhanced.

Patients of Poor Prognosis.

As a supplement we can take closely matched groups of poor prognosis for comparison. This group has illness of over three year's duration with gradual onset and very unstable previous personality.

The results given in Table IX, as we would expect, are poor. It is noteworthy that patients who recovered with insulin had no relapses on follow-up at one year; the majority of those discharged as improved have relapsed.

TABLE IX.—*Very Poor Prognosis Group. Illness Over Three years' Duration, Gradual Onset. Unstable Previous Personality.*

	Electronarcosis. (6) %	Deep insulin. (24) %	E.C.T. (14) %
Recovered	0	8.5	0
Improved and discharged	50	33	36
Improved, remaining in hospital	17	0	7
Not improved	33	58	57

Patients Treated by More Than One Method.

The above analysis of matched groups constitutes the main method of evaluating different methods of treatment. In certain circumstances the patient may himself serve as a control, i.e. when more than one method of treatment is given providing it is taken into account that the tendency to spontaneous recovery will, by itself, tend to give better results to the second treatment. It may be of interest, therefore, to compare the results when more than one method is applied to a patient.

There were no patients in whom electronarcosis or E.C.T. produced improvement after insulin had failed.

In 5 patients on whom electronarcosis produced no improvement, deep insulin produced total recovery.

In 16 patients where E.C.T. produced no improvement, deep insulin resulted in recovery or considerable improvement.

Eighteen patients of the total number failed to respond to electronarcosis, insulin and E.C.T.

Results Compared with those Obtained with Routine Hospital Care.

Ideally the appropriate method of obtaining controls for this purpose would be to select the patients for treatment and for control purposes at the same time, matched in all important respects and treated and assessed in precisely the same way except for the specific therapeutic process under consideration. This method is only possible when one has no faith in the treatment, or if it is in its early experimental stages, as otherwise it would be unethical to refuse a patient treatment purely for scientific purposes.

Thus other sources have to be used for control groups, and it has been the custom to use groups treated in hospital before the advent of the newer physical methods.

Guttman, Mayer-Gross and Slater (1939) have provided us with a group of 188 schizophrenics of relatively favourable prognosis—admitted to the Maudsley Hospital during 1934 and 1935 and followed up for three years. These cases were all of less than one year's duration of illness. The authors considered that any treatment giving better results than found with this group would be definitely justified.

Table X shows the treatment results with our group of patients with an illness of less than one year's duration, together with those followed up by

TABLE X.

	Control group. %	Electronarcosis. %	Deep insulin. %	E.C.T. %
Total recovery	21.5	15	55	15
Improved and discharged .	31	15	21	23
Hospital invalid	41	68	24	62

Guttman, Mayer-Gross and Slater. It will be seen that deep insulin treatment is the only method giving a significantly higher proportion of recoveries than the control group.

Dr. Finieis, of Three Counties Hospital, Arlesey, has published results for a group of 1,000 schizophrenics treated by routine hospital care, deep insulin therapy and E.C.T. (Finieis, 1948).

In patients with illness of less than one year's duration, deep insulin is the only treatment giving significantly better results than the control group consisting of those patients treated by routine hospital régime. It is interesting to note that Dr. Finieis' results with insulin are almost identical to ours.

In those patients with illness over three years' duration deep insulin results again show significantly better results than electronarcosis and E.C.T.

Prognosis.

It remains for us to consider what factors are of prognostic importance for these three methods of treatment.

TABLE XI.

	Control. %	Electro- narcosis. %	Deep insulin.		E.C.T.	
			Dr. Finiefs. %	Cardiff. %	Dr. Finiefs. %	Cardiff. %
Duration less than 1 year	49·5	30	74	76	52·6	38
Duration over 3 years	9·9	31	15	47	11	33

The Recovered and Discharged Improved groups were compared statistically with the not improved groups with respect to a large number of items for each treatment. The following items showed statistically significant differences.

Firstly, to take the Recovered groups in comparison with the Not Improved groups, we find that recovery, in all three forms of treatment, is associated with certain common features, viz. stable previous personality, broad interest, an illness of less than one year's duration and of sudden onset. The presence of exogenic factors, affective admixture and positive family history also occurred in higher proportion in the Recovered groups. A low rating of emotional and conduct disconnection was associated with recovery in the Electronarcosis group, and a high paranoid symptomatology rating with recovery in Insulin and E.C.T. groups.

Those patients improving sufficiently to be discharged also had a higher proportion of patients with a history of normal mental health before present illness.

The Not Improved groups also had common features with all treatments, viz. a clear predisposition to mental illness, very unstable personality, very schizoid; very touchy and suspicious in previous personality with narrow interests and gradual onset of illness.

Patients with high intellectual disconnection rating did not improve with electronarcosis. Those with high introversion rating did not respond to insulin, and patients with simple or hebephrenic types of schizophrenia showed poor response to E.C.T.

These, in brief, are the main items associated with good and unfavourable prognosis with the three methods of treatment.

The patients who tend to respond to these methods are those with the greatest tendency to spontaneous recovery.

In conclusion, our findings indicate that electronarcosis and electroshock therapy are far less effective than deep insulin therapy in the treatment of schizophrenia. The available evidence suggests that deep insulin therapy shows significantly better results than those resulting from routine hospital care.

Even deep insulin therapy cannot be regarded as a specific remedy for schizophrenia. Clearly, further research is urgently needed to determine the underlying processes responsible for recovery as well as the nature of the factors responsible for relapse, with the aim of discovering a specific remedy for what

is not only one of the most serious disorders in psychiatry, but surely one of the most mysterious illnesses in the whole field of medicine.

ACKNOWLEDGMENTS.

I have pleasure in thanking Dr. Hennelly, of Whitchurch Hospital, and Dr. King, of St. Cadoc's Hospital, for providing facilities for carrying out these investigations.

REFERENCES.

- BOWMAN, K. M., and SIMON, A. (1948), *Am. J. Psychiat.*, **105**, 15.
FINIEFS, L. A. (1948), *J. Ment. Sci.*, **94**, 575.
GARMANY, G., and EARLY, D. (1948), *ibid.*, **1**, 444.
GUTTMAN, E., MAYER-GROSS, W., and SLATER, E. T. O. (1939), *J. Neurol. and Psychiat.*, **2**, 25.
MAPOTHER, E. (1927) *Early Mental Disease*. *Lancet* series, p. 712. London.
MEDLICOTT, R. W. (1948), *J. Ment. Sci.*, **94**, 793.
Idem (1947), *New Zealand Med. J.*, **46**, 280.
PATERSON, S., and MILLIGAN, A. L. (1948), *Proc. Roy. Soc. Med.*, **41**, 575.
Idem (1947), *Lancet*, **2**, 198.
PIOTROWSKY, Z. A. (1939), *Psychosom. Med.*, **1**, 508.
TIETZ, E. B., THOMPSON, G. N., VAN HARREVELD, A., and WIERSMA, C. A. G. (1946), *J. Nerv. Ment. Dis.*, **103**, 144.
-

OBSERVATIONS IN ELECTRICALLY-PRODUCED EPILEPTIC CONVULSIONS. PART III: THE POST-CONVULSIVE DECEREBRATE STATE.

By R. KLEIN, M.D., and D. F. EARLY, L.R.C.P. & S.I., D.P.M.,

Bristol Mental Hospitals.

[Received 25 February, 1949.]

FOR a few seconds after the convulsion has ceased, whilst the patient is cyanosed and the breathing forced, there is complete flaccidity of all the body muscles. The first sign of muscular activity is a contraction of the masseter muscle, which holds the mouth tightly closed. This is followed by rigidity of a definite pattern; in its complete form the neck is retracted, the mouth closed, the shoulder flexed and adducted, the elbow flexed and the forearm pronated, the hip, knee and ankle joint are extended. Wrists, fingers and toes are invariably flaccid, offering no resistance to passive movements. In the extreme forms of rigidity the extension in the lower limbs is so intense that it is impossible to overcome it by force.

In cases in which the rigidity is less complete, the muscles most markedly contracted are the masseters, the extensors of the ankle and flexors of the shoulders; the increased tension of the muscles may be slight and easily escape observation. We considered the presence of ankle clonus as evidence of spasticity, when it was otherwise difficult to assess. There is, however, a small minority of cases in which the muscles of the limbs are entirely without tone. The state of rigidity lasts from one to several minutes. In a small number of cases following it, the muscles of the limbs become flaccid for a period varying from 1-3 minutes, after which time they regain their normal resting tone. In the majority of cases the patient then becomes restless and it is impossible to ascertain the muscular tone. The restlessness consists of mass movements of the extremities or of the body, of rapid, unco-ordinated and aimless movements in the arms and legs, or of turning or rolling movements of the body. In other cases these movements, whilst of the same character, are less generalized, and consist of thrusting or jerking movements in particular joints; they are purposeless, uncoordinated and undirected, of a pseudo-spontaneous character and they may be exaggerated by external stimuli (pin-prick). The next stage of motor reintegration carries the movements to a more co-ordinated and purposeful level; these are evoked by external stimuli and may consist of turning away of the stimulated part of the body or of brushing movements of the hand first directed into space, or at a part of the body some distance from the stimulation until finally a brushing movement is carried out at the point of stimulation.

The rigid limb shows the greatest resistance to the initial passive movement, but persists to some extent throughout the movement. When the rigidity is

of any considerable intensity the limb maintains the position, at any angle in which it is passively placed ; this is especially well demonstrable in the lower extremities. The rigidity has therefore definite plastic character.

The muscular tone can be influenced by neck and labyrinthine reflexes. Passive retroflexion of the head increases the flexor spasm in the arms, and extensor spasms in the legs. Anteflexions of the head causes relaxation of the muscular tone of the limbs. Turning of the head to one side relaxes the muscular tone of the opposite side and increases the tone of the limbs of the same side. This one-sided reaction is still more marked when the whole body is passively turned to one side while the head is kept fixed. When the body is turned from the supine into the prone position all the rigid muscles relax. All these reflexes have a tonic character, the alteration in muscular tone is maintained as long as the passive position of the head or body is kept up. The alteration in tone can only be demonstrated on agonistic rigid muscles ; no change can be found in the antagonistic flaccid muscles nor is there any reflex movement of the limbs when these tests are carried out. As has been mentioned in a previous paper (Klein and Early, 1948) vestibular stimulation by syringing with cold water fails to elicit nystagmus with slow and fast component, instead the eyes go into homolateral deviation. The same homolateral effect upon the eyes can be elicited by turning of the head to one side or by turning of the body to one side while the head is fixed.

During the whole period of rigidity the pupils are usually smaller than before the application of the shock treatment, and do not react to light. The corneal reflexes are absent. There is no reaction to nociceptive stimuli from any part of the body. The superficial reflexes are absent apart from some plantar response which consists of a flexor movement or fanning of one or two toes, corresponding to the area under pressure ; there is no combined flexor or other reaction of the toes. The tendon reflexes do not show any conformity : As has been pointed out by Kino (1944) some are increased, others diminished or absent altogether. Ankle clonus is, however, quite regularly present, even when the signs of rigidity are very slight. It is only absent in those cases where complete muscular flaccidity is maintained throughout the first stage of the post-convulsive phase. When this occurs, and when this phase lasts for any length of time without interference by involuntary movements, all the deep reflexes may gradually diminish or disappear altogether. But when rigidity is found, the briskness of reflexes proved to be dependent upon the tone of the effector muscles. Accordingly, since in the upper limbs a flexor spasm prevails, the biceps reflex is as a rule present or brisk, and the triceps and supinator reflexes are usually sluggish or not obtainable at all ; in the lower limbs where extensor spasm occurs the knee jerk and ankle reflexes are very brisk and ankle clonus is the rule.

Though at the cessation of the convulsions the breathing is difficult and irregular, at the time of the muscular rigidity its normal rhythm becomes re-established. Heart action is accelerated but regular, and the acceleration gradually diminishes during the rigid state. Vestibular stimuli are conducted and lateral eye movements can be reflexly elicited. There is finally a response of the motor branch of the trigeminus expressed by contraction of the masseter

muscles. All this suggests activity or excitability of centres of the brain stem up to the level of the mid-pontine region. Above this level no activity can be ascertained; there is no corneal reflex and the pupillary light reflex is absent.

We obtain a somewhat different picture when successive shocks are applied. A series of twelve patients were studied; we carried out this treatment with the additional purpose of gaining experience of the effectiveness of repeated shocks as a substitute for anaesthesia in transorbital leucotomy. In one session three shocks were applied, each successive shock after reappearance of the corneal reflexes in the post-convulsive phase of the preceding shock. Each patient was observed in four such sessions.

It was found that after the second shock the state of deep unconsciousness lasted much longer than after the first, and again that of the third much longer than that of the second. If after the first shock it took about 2-3 minutes before the patient showed signs of reintegration, it took about 4-5 minutes after the second, and 7-8 minutes after the third shock. In the post-convulsive state, the following observations were made.

The duration and intensity of the rigidity decreased progressively with the second and third shock. At the same time the state of complete muscular relaxation lasted longer after the second, and still longer after the third shock. In patients where, after the first shock an intense and extreme rigidity appeared, the rigidity was only moderate after the second shock and still less after the third. This applied to the muscles of the limbs; the masseter contraction remained the same throughout the three shocks. Immediately the convulsion had ceased the tendon reflexes were the same in the second and third shock as in the first, but the longer the relaxation of the muscles lasted the more sluggish they became, and in some cases they disappeared altogether. Even when the resistance of the muscles at the beginning of the post-convulsive phase showed only a slight increase, ankle clonus was still usual, though this clonus was less marked and of less duration than after the first shock. Throughout the rigid and flaccid stages tonic neck and body turning, eye reflexes were present, and phasic ipsilateral deviation upon syringing with cold water was obtainable. Tonic neck and labyrinthine reflexes were more difficult to assess in successive shocks, as the rigidity in the limbs was less marked. There was no corneal reflex and no pupillary light reflex. The end of this phase was marked by recovery of the tendon reflexes to normal, by the reappearance of the pupillary light reflex and the corneal reflex and of a dorsal response of the big toe. At this stage the following phenomena could be observed:

When the ear drum was stimulated either by tactile stimulus or by syringing, a sudden extension of the limbs occurred. In a complete reaction of this kind the legs became extended in all joints, the feet rotated inwards, the arms were slightly elevated, extended and pronated in the elbow, the wrists and fingers extended; the contraction of the muscles involved the flexors as well as the extensors with the same intensity. The same reflex could be elicited by stimulation of the cornea. In most of the cases this stretch reflex lasted as long as the trigeminus was stimulated, in one case it was extreme, and present for a few seconds after the cessation of the stimulus. In the majority of the observations the reaction was less complete, occurring

in some only at the initial stimulation or intermittently, and in others involving predominantly the muscles of the arms, whereas the legs showed only an abortive contraction. In others the homolateral limbs contracted; but in almost all cases the tendency to this reaction could be observed. From no other area of the body could this reflex be elicited, nor by any other manipulation, but occasionally it appeared automatically. There was no response to nociceptive stimuli from any part of the skin. When the stage of the reflex had appeared, the next phase of uncoordinated pseudo-spontaneous movements or general restlessness usually followed very quickly, and the reactive movements of the patients soon reached a more purposeful level.

DISCUSSION.

Experimental physiologists, Thiele (1905), Weed (1914), Beritoff (1915), Cobb and co-workers (1917), Bazzett and Penfield (1922), Magnus (1922), Rademaker (1926), Pollock and Davis (1930), Magoun and co-workers (1946), have been in general agreement that section of the brain stem at the pontine level in acute, as well as in chronic preparations, is followed by the type of rigidity originally described by Sherrington (1896). This finding is not entirely undisputed. More recently Keller (1939-46) has insisted that, in his experiments on dogs, section from mid-brain to lower pons was followed only for a few minutes by rigidity, which yielded to complete flaccidity with loss of the deep reflexes, and this flaccidity was maintained for several weeks. Magoun and co-workers assert that on stimulation of lateral parts of the reticular formation, limbs previously rigid suddenly became flaccid and collapsed and the reflexes disappeared; they assume that there are facilitatory and suppressor centres subserving the muscular tone in the reticular substance of the brain stem. Decerebrate rigidity has also caused considerable clinical interest, and there are a number of observations published in which a muscular rigidity appeared in the course of a localized lesion of the brain stem, Turner (1916), Wilson (1920), Magnus and de Kleyn (1921), Walshe (1923), Weisenberg and Alpers (1927), Zand (1928), Walschönok (1929), Manson and Ferguson (1930), Epstein and Yakovlev (1930), Carmichael (1932), Thorpe (1935), Davis (1935), Nielsen (1941), Penfield and Erickson (1941), Davidenkov (1946), O'Neill (1946).

The clinical problem was first extensively discussed by Wilson. He took as the criterion of decerebrate rigidity the rigid posture and the muscular spasticity, and describes a variety of clinical pictures.

This rather loose conception has since been applied in most of the publications in spite of Walshe's efforts to bring clinical decerebrate rigidity more in line with the classical experimental picture.

Walshe, in explanation of clinical decerebrate rigidity, postulates the presence of plasticity of muscular tone, of lengthening and shortening reflexes and of the Magnus and de Kleyn reflexes. He would exclude cases in which the rigidity is, in his opinion, an irritative phenomenon and due to discharge, as in anoxaemic conditions, or in unconscious patients with absent light reflexes, raised temperature and pulse irregularities. He also excludes cerebellar fits. Walshe (1923) reported a case of a tumour in the interpeduncular space

in which he could demonstrate all the characteristics of a decerebrate rigidity, whilst the above complicating factors were absent. A similar case has been reported by Davis (1925). There are, however, cases of brain stem lesions described (Turner, 1916, Walschonok, 1929), where the picture was complicated by the symptoms mentioned by Walshe, and yet a rigidity, constant over a period of weeks, could be observed; this long duration is not in favour of the irritation theory. Similarly, it is difficult to accept Keller's (1945) opinion when he regards rigidity following experimental decerebration as an altogether irritative phenomenon. There seems to be no necessity to connect the otherwise typical rigidity in our observations with irritation, although it is likely that the post-convulsive decerebrate state is associated with anoxaemia. Positive evidence of its reflex character will be given later when pathological material is being discussed. Though typical, the rigidity in our observations has some particular features. It was found that in the mild forms of rigidity only one or two joints of the limbs show marked spasm, whilst all other joints appear less involved; there is no similar finding reported either in experimental or clinical decerebration. In animal experiments the method of testing may account for this; postural tests are mainly used for assessing rigidity; spasms of this kind can thus easily be overlooked, so that preparations not entirely free from rigidity may pass as flaccid. Of some interest in our cases is the early transition from rigidity to flaccidity with lowering of the reflexes. This occurrence is emphasized by Keller, although not the rule in animal experiments. The tonic neck reflexes were different from the usual description only in that no tone increase occurred in the antagonists when the agonists relaxed; therefore no reactive movement of the extremities took place. The presence of tonic labyrinthine reflexes could be demonstrated by changing the patients posture from the supine to the prone. The tone of the rigid muscles consequently relaxed, and the relaxation was maintained as long as the patient was kept in the prone position, but there was no reflex movement of the limbs. The phasic and tonic eye reflexes found at this stage were analysed in a previous paper (Klein and Early 1948). The influence on the muscular tone of the limbs was strongest when the patients were moved into the lateral position with head fixed; the response consisted of a contralateral relaxation and a homolateral increase of the rigidity, identical with the reaction seen when the head is turned to one side. Neck reflexes were, however, excluded by fixation of the head. It seems unlikely that stimuli from the body surface could have had any influence, since there is at this stage no response to superficial stimuli. This suggests a labyrinthine origin. It has been found under experimental conditions (Magnus 1921), that tonic labyrinthine reflexes can be elicited by alteration of body posture in the vertical plane, but not in the horizontal. Since this experimental finding was an important point in the explanation of the mechanism of the tonic labyrinthine reflexes, our conflicting observations are of some interest.

The rigidity is only a part of the decerebrate state. Though it has been proved that a local process in the brain stem can produce a rigidity which is closely related to experimental rigidity, there is no actual decerebration under these conditions. As Wilson (1921) pointed out, unless the interruption is

absolute the cortex (we may add subcortical centres) may, and often does, interfere in part with the activity of the lower centres. It is therefore of no great value to make comparisons between our observations and such lesions. We have sufficient clinical evidence to assume that at this stage the central nervous system is acting at a pontine level functionally isolated from higher centres. Experiments in which functional conditions similar to the post-convulsive state have been produced were carried out by Ward and co-workers (1947). These authors found after intravenous injection of sodium cyanide a rigidity indistinguishable from decerebrate rigidity. Electro-encephalographic records demonstrated that the electric activity of all structures above the level of the midbrain was abolished by appropriate doses. If, as we assume, the conditions produced by these experiments are comparable to those of the post-convulsive state, then they confirm our clinical conclusions. However, compared with that in animals, the functionally isolated brain stem in our observations shows considerable differences in function, the pattern is primitive, the reflex response is reduced to a minimum and is of a primitive nature. The tone regulating centres can draw only on two afferent sources from which stimuli are conducted: the muscle proprioceptive and the vestibular system. We do not suggest that this difference is due to a difference in function of the isolated brain stem between human and animal. Under the conditions of our observations a sharp borderline between active and inactive nerve tissue cannot be expected. There may be variations in degree of activity in different cell groups, some areas may be depressed, others may be more active. Such factors could explain why we may fail under these conditions to obtain a complete picture of brain-stem functions. It may be that such factors interfere less in experimental decerebration.

In slowing down the re-evolution by the application of successive shocks, the first sign of re-integration is the recovery of the deep reflexes and the reappearance of reflex movements upon superficial stimulation. It is at this stage that the trigeminal stretch reflex can be elicited. As a muscular reaction, it differs strikingly from the initial rigidity; there is invariably an extensor posture of all the limbs in which all the joints participate, and in which the muscles, agonistic as well as antagonistic, are in intense contraction. The fully developed picture is, so far as the limbs are concerned, indistinguishable from the tonic phase of the epileptiform seizure. The transient character of the stretch reflex did not permit the study of the behaviour of the muscles under passive movements, but in the tonic phase of the epileptiform fit we found the same plasticity as in the initial decerebrate rigidity. The trigeminal stimulation evokes a reaction to which some tendency already exists; at this stage a spontaneous stretch posture, particularly in the upper extremities can be seen intermittently in a number of patients. The response upon trigeminal stimulation is thus comparable to the provocation or intensification of rigidity in decerebrate animals by the application of nociceptive stimuli (Weed 1914), or by direct trigeminal stimulation (Leiri, 1926), and similar to an observation by Carmichael (1930). At a period when the stretch tendency in the decerebrate state occurs, a redistribution of tone can be noted. Instead of the two extremes of a selective muscular contraction or complete muscular flaccidity

found in the initial stage, the tone in agonist and antagonist now becomes equal with no preponderance of either group. Passive movements in the presence of normal deep reflexes indicated that the tone is not different from its normal qualities. The general muscular contraction is thus in line with the basically even distribution of tone between agonist and antagonist. Muscular tone is dependent upon afferent impulses. At the initial rigid state these impulses are limited to proprioceptive and vestibular stimuli. In this later stage extraceptive impulses have started to exert their influence, and the increase of afferent impulses may have some relationship to the distribution of tone. The reappearance of the pupillary light reflexes at this period indicates that the activity of the brain has shifted to mid-brain level. The general clinical picture, however, has not changed, and there is no evidence that the change in the muscular reaction is due to influences from higher centres. The picture is still a decerebrate state which probably works at brain-stem level. The obvious structure at this level which might be responsible for the redistribution of tone is the red nucleus. Though the observations of experimental physiologists as to the significance of this nucleus are conflicting, it is established that a typical decerebrate rigidity appears in sections below the level of the red nucleus. According to Rademaker (1926) who draws his conclusions from the literature and from his own experiments, muscular tone is normal in animal preparations when the red nucleus is left intact, which would explain the redistribution of tone at this stage of reintegration in our observations. But again the functional performances are of much lower order than in animal preparations which might correspond to this level. The number of reflex reactions is still very restricted at this stage; the only reflex of "local signature" on superficial stimuli is the dorsal response of the big toe, appearing for the first time. There is no body righting reflex upon turning the head, nor can any co-ordinated muscular action be elicited, only mass movements. This low performance level may be due to underlying conditions, but the fact remains that under decerebrate conditions a characteristic redistribution of tone occurs consequent to a shift of activity from lower to higher brain stem levels without interference of higher centres.

In the next stage, involuntary movements of varying type are the most outstanding features. Their character suggests that the re-integration has reached subcortical level. The picture becomes complex, the patient may enter a semi-conscious condition or such condition may soon follow; they have thus passed the decerebrate state which is the subject of this paper.

REACTION OF CASES WITH LESIONS OF THE C.N.S.

In the following cases with lesions of the nervous system the effect of loss of function upon the post-convulsive decerebrate rigidity was studied.

1. Three patients with unilateral absence of the ankle reflex were investigated. The motor power in these cases was intact and there was no disturbance, either in superficial sensation, position or vibration sense. The post-convulsive spasticity in the extensors of the legs was slight, ankle clonus on the normal side was marked, whilst absent on the side of the missing ankle reflex.

Viets (1920) who studied the physiology of patellar clonus in decerebrate preparations, found that there is a most favourable point of muscular tension for the maintenance of clonus. The presence of the ankle clonus in the post-convulsive decerebrate rigidity is almost the rule, whilst patellar clonus is rare. This may be explained by the fact that rigidity in the calf muscles is more constant and stronger than elsewhere, with tension favourable to clonus. But the ease and regularity with which a sustained ankle clonus can be produced in our observations without appreciable clinical spasticity of the calf muscles is still surprising. This suggests that the tone of the antagonist muscles, their resistance and the relation between tone in agonist and antagonist is significant in the maintenance of clonus. By the nature of this reflex, these factors would be more important for ankle clonus than for patellar clonus. In our three cases the failure to obtain ankle clonus on the side of the missing ankle reflex is primarily a failure of the calf muscles to contract during the rigidity and to set the basic condition for clonus. Sherrington, by cutting the dorsal roots of a particular muscle group, showed that this muscle group failed to contract during the decerebrate rigidity, thus demonstrating the dependence of the rigidity upon afferent impulses and its probable reflex character. Our observations correspond clinically to Sherrington's experimental condition and we regard these observations as strong evidence for the reflex character of the post-convulsive rigidity.

2. Observations on a female patient, 39 years old, who 12 years previously had an acute spinal disease, probably a myelitis. She came into hospital with a depression. On neurological examination she showed a hyperaesthesia for touch, prick and temperature from D.3 downwards. In the left leg there was a slight extensor spasm in knee on initial passive movements, which became flaccid after the first resistance had been overcome. No extensor resistance in hip, slight contraction of ankle in middle position, the active stretching in hip and knee showed reduced muscular power. Active flexion of hip and knee was impossible. There were also reduced active movements in ankle and toes. In the right leg the motor power of all the big joints was good, but there were no active movements in the toes. The muscles in this leg were slightly hypotonic. The position sense of the right big toe was inaccurate. Vibration sense of right much less than on the left. Abdominal reflexes were brisk and equal on both sides. Both knee reflexes were brisk. No ankle reflex was obtainable on the right, but it was very brisk on the left. Definite dorsal response of the big toe on the left; on the right equivocal response. Cranial nerves and upper limbs were intact. The patient had E.C.T. In the tonic phase of the convulsions no difference could be seen in the contraction of both legs, the twitching in the following clonic state was less in the left leg than in the right. In the post-convulsive phase both arms were in slight flexor spasm of the usual type, on the left there was extreme extension in hip and knee, whilst the right leg was completely flaccid in all the joints throughout. Definite neck and labyrinthine reflexes upon the right leg and the arms were present. By bending the head passively forward the rigidity in the left leg diminished considerably; the left leg became completely flaccid when the body was turned head fixed, into right lateral or supine position.

In this case the most striking observation in the post-convulsive stage was the complete flaccidity of the right leg in contrast to the rigidity of all the other limbs.

In investigations of more than 200 patients in the post-convulsive stage of E.C.T. the rigidity of the two halves of the body was always found equal in

distribution and intensity when the nervous system was intact. The incongruity of complete flaccidity of the right leg in this case, therefore, must be related to the neurological lesion. In the right leg there was a deep sensory loss and an absent ankle reflex, but the knee jerk was present and brisk. The absence of rigidity in the calf muscles was in accordance with the findings in the three preceding cases, but could not be predicted in the remaining extensors. An absent tendon reflex seems to indicate that afferent impulses, necessary for the reflex rigidity of the muscles concerned, are not conducted, but its presence does not assure contraction. It follows that the routes on which the afferent proprioceptive impulses travel are not the same as for the spinal reflex arc and for the brain stem centre which is responsible for the rigidity.

In the left leg where pyramidal signs were found together with a weakness in the flexor group, the extensor rigidity was very intense. Extreme reactions are not exceptional, but usually they manifest themselves with equal intensity everywhere. The right leg did not take part in the rigidity. The arms, however, were intact and the rigidity was light, not in harmony with the strong reaction of the left leg. Apparently the reaction of the left leg was intensified by the defect of this extremity, due to damage to its pyramidal pathways. The part played by the pyramidal tract in the decerebrate rigidity has been studied in animal experiments. Weed (1921) in a decerebrate preparation hemi-sectioned the bulb above the pyramidal decussation, and found no change in the rigidity on the contralateral side. Thiele (1905) caused the pyramidal tracts to degenerate prior to the brain stem trans-section and found no change in the nature and extent of the rigidity. He concluded that the pyramidal tracts have no relation to the causation of decerebrate rigidity. As the brain stem trans-section involves a section of the pyramidal tract it is difficult to see why an additional severance of this tract should influence the result of the trans-section. And yet in the functionally isolated brain stem of our observation a long standing degeneration of the pyramidal tract seems to have intensified the rigidity. Two explanations are possible: (a) That the functional isolation of the brain stem in the post-convulsive state is not as complete as the clinical picture suggests; some cortical (pyramidal) impulses may still have been transmitted, and unless there is an additional pyramidal lesion the maximum rigidity does not develop. This explanation is not supported by experience of brain stem trans-sections, nor of the post-convulsive state where, under constant conditions, a great variation in the intensity of the rigidity is observed. (b) That the pyramidal lesion, by lowering the threshold of the motor centre of the brain stem and spinal cord to proprioceptive stimuli, has intensified the release reaction. This is the more likely explanation of our case.

3. The next case was seen after a succession of spontaneous epileptic seizures. He was a man of 32 years of age, a chronic hospitalized schizophrenic. Six years ago he developed a left-sided hemiplegia. His cooperation was poor on examination. The left arm was flexed and adducted at the shoulders, flexed and pronated at elbow, flexed at wrist and fingers. The left leg was extended at all the joints. He did not move the left arm actively, and in the left leg only slight flexion of the hip and knee was carried out. On the left there was a severe disturbance of superficial sensory qualities, the position sense was diminished in fingers and big toe. There was strong passive resistance to the stretching of the left shoulder and of the

left elbow, and very strong resistance to the passive flexion of the left hip and of the left knee.

In the last two years the patient has developed epileptiform seizures. He was seen after he had had three successive fits at short intervals. He was unconscious, and it was found that the muscles of the limbs of both sides were completely flaccid. He was again examined after he had two further fits without regaining consciousness. It was then found that the left arm was flexed and adducted at the shoulder and pronated and extended at elbow with contraction of flexors and extensors. The hand and fingers were in the same position as before the fit. There was strong passive resistance to lifting and adducting of the shoulder, as well as to flexion and supination of the elbow. The left leg was extended in all joints and rigid in this position. The rigidity in both these extremities was of "clasp-knife" character, which broke down after the initial resistance had been overcome. In contrast the right extremities showed no tone increase. Passive bending forward of the head immediately relaxed the tone on the left side, and the same occurred by turning the body to the right. The tone of the left side increased when the body was turned to the left. On the left there was a Babinski response with patellar and ankle clonus as before the series of fits. On the right the reflexes were approximately the same as before the fits. After a few minutes pseudospontaneous movements began, and at the same time the left arm went into the same flexed position as before the fits. Tonic neck reflexes could not be elicited any more.

In this case a lesion of the right hemisphere was present by which considerable parts of the right cortical and perhaps also subcortical regions were eliminated or cut off from lower centres. There was evidence of a pyramidal lesion with the characteristic posture and alterations in tone and reflexes. The rigidity found in the post-convulsive phase after a series of fits was not just a reappearance of the hemiplegia. The arm, otherwise flexed in elbow with spasm in the flexor group, became extended with contraction of agonist and antagonist. Tonic neck reflexes could be elicited which were not previously present. This altered picture was thus not solely determined by the motor lesion which existed before, but must be related to the post-convulsive functional decerebration. The right intact extremity did not take part in the rigidity, therefore the post-convulsive muscular rigidity on the left was facilitated by the pyramidal lesion as in the previous case. The picture is apparently similar to that elicited by trigeminal stimulation and to the spontaneous stretch reaction occasionally seen in a later stage of the post-convulsive phase.

4. The next patient, male, 42 years old, had a Parkinsonism for about five years; he developed depressive-obsessional features and was treated with electric shock. On examination he showed a rigid facial expression, dysarthric speech and a marked right-sided rigidity with cog-wheel character in the wrist. The muscular power was satisfactory. The left extremities showed nothing abnormal. The deep reflexes were brisk, equal on both sides, and there were no pyramidal signs, nor was there any sensory loss.

In this case there was a strong post-convulsive rigidity of the usual type, the upper limbs in flexion, the lower limbs in extension and no difference in intensity nor in distribution between the two sides. The extrapyramidal lesion of the right extremities had therefore no influence upon the post-convulsive rigidity.

5. A 26-year-old schizophrenic who ten years previously had poliomyelitis. On examination he showed a complete flaccid paralysis of the right quadriceps with wasting of this muscle and loss of knee jerk, slight decrease in the right flexor

group of the knee, restriction of the dorsal flexors of the foot with preservation of the extensor digitorum only. The calf muscles were intact. There was no sensory loss on the right. There was no disturbance in the arms nor in the left leg. During the tonic phase of E.C.T. the left intact leg went into extension with contraction of all the muscles, whilst the right leg became flexed in hip and knee. There were no definite movements in ankle and toes. Almost immediately after the cessation of the convulsion the post-convulsive rigidity set in, the arms were flexed and adducted at both shoulders, flexed and pronated at elbow, and there was considerable resistance to passive extension of these joints. The left leg went into strong extension in the usual way; hip, knee and foot were extended. The right leg, however, showed flexor rigidity in hip and knee of much the same intensity as the extensor rigidity of the left leg. There was an ankle clonus though less marked and sustained than on the right leg.

The paralysis of the knee extensors in this case was evidently the cause of an alteration in the rigidity pattern. Instead of the usual extensor spasm in knee and hip a flexor spasm occurred in both joints though the hip extensors were functionally intact. Sherrington's interpretation of the extensor rigidity as a static reflex counteracting gravity is still accepted, but this does not explain why the flexors of the knee should contract when the extensors are paralysed, and still less does it explain the contraction of the hip flexors instead of the intact extensors. In our case the action of the tone regulating centre was apparently not to produce extension but to distribute the tone into the extensor group; as this was not possible for peripheral reasons the impulses of this centre were switched into the flexor group instead. Thus the distribution of tone to synergic muscle groups in a simple extensor-flexor pattern was the over-ruling factor on which the isolated brain stem centre worked. The fact that the flexor group contracts readily when one of the antagonists is out of action suggests also that this contraction has been facilitated by the absence of inhibition, which exists in the flexors under the usual conditions of extensor rigidity. This reaction has some relation to experimental findings (Brown and Sherrington, 1912) in which by repeated stimuli of a particular point of the motor cortex the extensor response was reversed into a flexor reaction or with the reversal of the response by the reversal of the initial position of a responding limb (Ward, 1938). According to Lorento de No' (1939), the transmission of an impulse through any neurone is not a fixed, predetermined event, but to a certain extent optional.

6. A woman, 45 years of age, was treated for an acute excitement; her left leg was amputated at the age of 14, just below the hip joint. The stump was feebly movable and the muscular power for flexion and for extension was very good, not much less than that of the intact right leg. She showed in the post-convulsive state a marked flexor rigidity in both arms and an extensor rigidity in the right leg. The hip joint of the left amputated leg was completely flaccid.

Two explanations can be offered for the non-participation of the stump in the rigidity. (1) Because of the absence of most of the muscles the proprioceptive stimuli may have not been sufficient to activate the brain stem centre, or (2) assuming a tone distribution to synergic muscles as the basic necessity in the activity of the brain stem motor centre, the conditions for this activity were unfulfilled in this case.

SUMMARY.

The post-convulsive state gives an opportunity for analysis of decerebration on a large scale such as is offered by no other clinical condition. Clinical evidence suggests that the functional level at the initial stage of the post-convulsive decerebration is the pontine level. As the decerebration is due to a transient functional isolation and not to an anatomical severance there is no dividing line between functioning and non-functioning nervous tissue. It is therefore possible that within an area or at a level where certain centres are found functionally active, others may be inactive, or various centres may have a varying degree of activity. The picture obtained cannot, therefore, claim to demonstrate optimum functional conditions in decerebration or to be representative of the functional pattern of the isolated human brain stem. Under these special conditions the pattern is well defined. Compared with animal preparations, where the level of severance can be regarded as approximately the same as the level of functional isolation in our observations, the ascertainable functions are inferior. In isolating the various components of the resulting primitive reflex mechanism we found that on the receptive side the muscle proprioceptive and vestibular stimuli were the only afferent impulses. The corresponding picture on the reactive motor side was a rigidity, with phasic and tonic reflexes of the rigid muscles of the limbs and of the eye muscles upon proprioceptive and vestibular stimuli. In distribution and character the rigidity appeared to be closely related to the experimental rigidity; the rigid muscles showed a plastic tone and tonic neck and labyrinthine reflexes were present. We established that muscle tone and deep reflexes were correlated, e.g. the reflexes of the rigid muscles were present or exaggerated, those of the flaccid muscles were diminished or absent. There were, however, some special features. Wrist and fingers were always free from rigidity and ankle clonus was the rule. Among the postural reflexes the influence on rigidity of lateral body movement with fixed head was discussed.

On observation of cases with lesions of the C.N.S. evidence of the reflex character of the rigidity was given. There was some indication from these observations that degeneration of the pyramidal tract enhanced the rigidity in contrast to findings in animal experiments. No difference between the two sides in the post-convulsive rigidity was found in a case of hemi-Parkinsonism. In a case with unilateral paralysis of the quadriceps femoris the usual extensor spasm in the lower limbs was converted into a flexor spasm in the affected leg.

When the decerebration was more prolonged the rigidity could not be maintained and was replaced by a general flaccidity and diminution of reflexes. Following this in the course of reintegration a redistribution of tone took place. The muscular tone became equally distributed between agonists and antagonists, and the tendon reflexes attained their normal briskness. At this period a dorsal response of the big toe appeared. It was at this stage that a general contraction of the limb muscles occurred upon trigeminal stimulation, a contraction which occasionally set in automatically. Clinical evidence indicated a shift of activity to midbrain level.

We would like to express our thanks to Dr. R. E. Hemphill for permission to make use of the material from this hospital.

REFERENCES.

- BAZETT, H. C., and PENFIELD, W. G. (1922), *Brain*, **45**, 185.
 BERITOFF, J. S. (1915), *J. Phys.*, p. 147.
 BROWN, T. G., and SHERRINGTON, C. S. (1912), *Proc. Roy. Soc. B.*, **85**, 250.
 CARMICHAEL, E. A. (1929-30), *J. Neur. and Psychopath.*, **10**, 324.
 COBB, S., BAILEY, A. A., and HOLTZ, P. R. (1917), *Am. J. Phys.*, **44**, 239.
 COBB, S. (1920), *M. Clin. N. Am.*, **4**, 467.
 DAVIDENKOV, S. (1946), *Ref. Bull. War. Med.*, **6**, 278.
 DAVIS, L. E. (1925), *Arch. Neur. and Psych.*, **13**, 569.
 EPSTEIN, S. H., and YAKOVLEV, P. I. (1929-30), *J. Neur. and Psychopath.*, **10**, 295.
 KELLER, A. D. (1945), *J. Neurophys.*, **8**, 278.
 Idem and HARO, W. K. (1934), *Arch. Neur. and Psych.*, **32**, 1253.
 KINO, F. F. (1943), *Brain*, **66**, 154.
 Idem (1944), *J. Ment. Sci.*, **90**, 592.
 KLEIN, R., and EARLY, D. F. (1948), *ibid.*, **94**, 581.
 LEIRI, F. (1926), *Pflug. Arch. Phys.*, **212**, 265.
 LORENTO DE NO', R. (1939), *J. Neurophys.*, **2**, 402.
 MAGNUS, R. (1924) *Koerperstellung*, Berlin.
 MAGOUN, H. W. (1944), *Science*, **100**, 549.
 Idem and RHINES, R. (1946), *J. Neurophys.*, **9**, 165.
 MANSON, J. S., and FERGUSON, F. R. (1930), *Brit. Med. J.*, **2**, 768.
 NIELSEN, J. M. (1941), *Trans. Am. Neur. Assoc.*, 29.
 O'NEILL, H. (1946) *Arch. Otolaryng.*
 PENFIELD, W. G., and ERICKSON, TH. C. (1941), *Epilepsy and Cerebral Localization*.
 POLLOCK, L. J., and DAVIS, L. E. (1924), *Arch. Neur. Psych.*, **12**, 288.—(1930), *J. Comp. Neur. Psych.*, **50**, 377.—(1930), *Am. J. Phys.*, **92**, 625.
 RADEMAKER, G. G. J. (1926), *Die Bedeutung der roten Kerne*, Berlin.
 SHERRINGTON, C. S. (1896-97), *Proc. roy. Soc.*, **60**, 411.—(1898), *J. Phys.*, **22**, 319.—(1939), *Selected Writings*, edit. by D. D. Brown. London.
 THORPE, E. S. (1935), *Ann. Surg.*, **101**, 338.
 THIELE, F. H. (1905), *J. Phys.*, **32**, 358.
 TURNER, V. (1916), *Brit. J. Dis. Child.*, **13**, 261.
 VIETS, H. (1920), *Brain*, **43**, 3269.
 WALSCHONOK, O. S. (1929), *Ztschr. Neur. Psych.*, **122**, 348.
 WALSHE, F. M. R. (1921), *Med. Science*, **4**, 427.—(1923), *Lancet*, **2**, 644.—(1923), *Brain*, **46**, 1281.
 —(1923), *Arch. Neur. Psych.*, **10**, 1.
 WARD, A. A. (1947), *J. Neurophys.*, **10**, 89.
 Idem and WHEATLEY, M. D. (1947), *J. Neurop. and exp. Neur.*, **6**, 292.
 WARD, J. W. (1938), *J. Neurophys.*, **1**, 463.
 WEED, L. H. (1914), *J. Phys.*, **48**, 205.
 WEISENBERG, TH. H., and ALPERS, B. J. (1927), *Arch. Neur. and Psych.*, **18**, 1.
 WILSON, S. A. K. (1920), *Brain*, **43**, 222.
 Idem (1924), *Arch. Neur. Psych.*, **11**, 385.
 ZAND, N. (1928), *J. Nerv. and Ment. Dis.*, **67**, 105.

CONVULSIVE TREATMENT IN 56 TUBERCULOUS MENTAL PATIENTS.

By BJARNE JENTOFT, M.D.

From the Gaustad Mental Hospital, Oslo, Norway.

[Received 30 March, 1949.]

Of the various pathological states mentioned as contraindications against convulsive treatment in mental disease, tuberculosis and other affections of the lungs rank among the most important. It may generally be considered less dangerous than insulin coma therapy (which has been observed to activate pulmonary tuberculosis), but many authors warn against it. Very few, however, have actually published observations of exacerbations of the tuberculous process consequent to convulsive therapy.

The factors in convulsive treatment which have been supposed to involve a risk in connection with tuberculosis, are, in the first place, the violent convulsions, and the subsequent hyperventilation. Factors of a physical, chemical and immuno-biological nature are also given. The hypothetic mechanism would be for such factors to break down fibrous barriers, thereby activating latent processes, or aggravating pathological states already active.

Certain measures have been proposed to prevent this danger. Based upon the assumption that the prolonged stop of respiration, with collapse of the lungs and inhibition of the respiratory centre, may be harmful, the administration of artificial respiration following each treatment has been advocated. Hyperventilation preceding each treatment, as well as inhalations of oxygen, has been recommended. Spraying of the ear passages with cold water has been mentioned as a respiratory stimulant. Turning the head from one side to the other is supposed to stimulate the respiratory centre, as well as to facilitate the passage of air through the upper bronchi. Sensory stimulants (such as slapping of the face) have been used. Metrazol, lobeline, etc., are generally considered as being of a merely prophylactic value.

It is claimed by some authors that pulmonary complications are more frequent following metrazol than with electrically induced convulsions. But such complications have been effectively prevented by precautions against aspiration pneumonia, and by adding to the metrazol solution an anti-coagulant in order to prevent embolism. This seems to prove that metrazol in itself has hardly any deleterious effect upon the lung tissue.

Since 1939 all patients at the Gaustad Mental Hospital have undergone regular examination by a specialist in pulmonary diseases. This has made it possible to register effectively all cases of lung pathology, and to control the patients according to need. Up to March, 1947, the total number of patients with pulmonary tuberculosis was 137, 69 men and 68 women. These figures

cover all pathological conditions, from sequelae of pleurisy and inactive infiltration up to active tuberculous processes. Of these patients, 62 (29 men and 33 women) had up to the given date been subjected to convulsive treatment (metrazol or electrical convulsions or both). The material is too small for an elaborate statistical analysis, but a general survey of the results may be of interest, since relatively few observations on similar material have been published.

Three men and three women were excluded because the observation period was insufficient. In the remaining 56 patients the following observations were made with regard to their pulmonary condition :

In 12 patients convulsive treatment was followed by an aggravation of the pulmonary symptoms, but in only three of these was there a possible connection between the treatment and the activation of the pulmonary tuberculosis. In the remaining 9 patients such a connection was most unlikely, as the aggravation occurred after an interval of $1\frac{1}{2}$ to $2\frac{1}{2}$ years.

In 9 cases the pulmonary condition improved during and after convulsive treatment. In the remaining 35 cases no change could be observed.

Among the 56 patients, 20 were suffering from a destructive tuberculosis, as proved by X-ray and bacillary findings. In 7 of these cases there was some aggravation, but only in two of them was the aggravation possibly caused by the treatment. In 3 of the patients the pulmonary tuberculosis improved.

Twelve of the cases were non-destructive, but bacillary tuberculous infiltrations. In 9 of these cases there was no change following convulsive treatment, in one case the condition was aggravated, and the remaining two improved.

Twenty-four patients suffered from inactive forms of pulmonary tuberculosis. Sixteen of these showed no change following convulsive treatment, 4 got worse, and 4 showed improvement. The figures are inconclusive, but seem to indicate that the reaction towards convulsive treatment is very much the same in inactive as in destructive cases of pulmonary tuberculosis.

CASE I.—Anne O—, female, married, aged 44. Diagnosis : Catatonic schizophrenia (?) Her father committed suicide. Her past life was uneventful, no history of tuberculosis. She is described as a hard-working type, intelligent, living in good circumstances with her husband and two children. When the war broke out, she became nervous and read the Bible frequently. In June, 1942, acute panic with excitation, talked about being God and of having destroyed the world, was actively suicidal and refused food. She was treated in a local mental hospital for two months, and then nursed in her home until admission. During this period she showed loss of initiative and interests, would mostly stay in bed, but could do some house work when pushed. She talked about her sins, and made several attempts at suicide, refused food and lost much weight.

On admission to the Gaustad M.H. in April, 1943, she was negativistic and mute, took no interest in her surroundings. Her attitude was tense and slightly hostile, without any trace of depression. She was undernourished and had to be tubefed (weight 40 kgm.). X-ray of lungs negative, apart from a slight elevation and immobilization of the diaphragm on the right side. Sedimentation rate 20 mm.

Between 29 May and 25 June she had 9 metrazol treatments, and her mental condition improved markedly. Then a renewed X-ray showed infiltration of right lung, treatment was discontinued, and she relapsed mentally. The sedimentation rate increased, and reached a maximum of 92 mm., and she had an irregular fever up to 39.3. In December, 1943, 6 acetylcholine shocks were given, with hardly any result.

17 December, an artificial pneumothorax was applied (in part as a preparation

for renewed convulsive treatment). From January until March, 1944, she then received 16 metrazol treatments, after which she had a complete remission. She was bright, active and spontaneous, with complete insight. Her weight was 54 kgm., and there were no bacilli in her sputum. Discharged to her home as cured in August, 1944. In April, 1947, her husband reports that she is mentally well, and is keeping up the pneumothorax treatment.

Conclusion.—Possible aggravation of tuberculosis due to convulsive treatment (one of the three cases).

CASE 2.—Margit K.—, female, single, aged 37. Diagnosis: Paranoid schizophrenia. She is described as ambitious and headstrong, somewhat "difficult," sexually indifferent. Worked as a trained nurse. She had pleurisy in 1931, pulmonary tuberculosis in 1935, treated in hospital with good result. In 1938 she developed what she describes as a "soul complex," and turned catholic. Summer, 1939, sensitive and self-conscious, with gradual development of ideas of reference. In June, 1940, paranoid ideas and hallucinations, unreasonable, admitted to psychopathic hospital, had 15 metrazol treatments and improved somewhat. Back in her home she relapsed irritable and without insight, unmanageable, somatic hallucinations and delusions of influence, loss of initiative and interests.

She was admitted to the Gaustad M.H. 1941, and was a most difficult patient, periodically disturbed and combative, actively hallucinated. During 1942, 1943 and 1944, she had 13 short courses of metrazol treatment with altogether 48 convulsive shocks. In 1945 five short series of acetylcholine injections were given. During this period there was no radiological or clinical evidence of any progress of her pulmonary disease, and her sedimentation rate remained unchanged.

In May, 1946, leucotomy was performed, with some pacification of the usual type. The patient died suddenly in January, 1947 (paralysis cordis), and a post-mortem examination showed widespread tuberculous changes in both lungs, with fibrosis and caseation.

Conclusion.—No pulmonary change following convulsive treatment.

It is concluded that among 56 mental patients with active or inactive pulmonary tuberculosis who were given convulsive treatment, 12 cases were found in which the pulmonary process showed progress following the treatment. But in three of these cases alone is there a possibility of this aggravation being actually caused by the convulsive treatment. On the other hand, patients with extensive and active tuberculous changes (in one case even a contra-selective pneumothorax) have been observed to show steady improvement, both during the treatment and for years afterwards. The tuberculous process is capricious, and conclusions should be drawn with the greatest care. But, on the whole, the results in our small group of 56 patients seem satisfactory, and most likely the tuberculosis would have shown a less satisfactory development in these cases if convulsive treatment had not been instituted. One might be justified in concluding that pulmonary tuberculosis should not be considered an absolute contraindication against convulsive treatment. On the contrary, such treatment may very often be considered even more strongly indicated on account of the pulmonary disease, because the tuberculosis may yield to the improvement in the patient's mood, habits and nutritional state, which is assured by convulsive treatment. It is common experience that tuberculosis tends to take an unfavourable course in mental patients who are depressed or excited or in any way unmanageable.

In treating tuberculous patients one should, naturally, take particular care to prevent pulmonary complications: Aspiration must be avoided, teeth, mouth and nose must be examined, and any existing infections attended to.

The patients should be kept under close supervision before, during and after convulsive treatment, with regard to X-ray findings, sedimentation rate, weight and temperature. Good nutrition is essential. The patient should be kept in bed if there is any sign of pulmonary activity, and during such stages the convulsive treatment should preferably be given in shorter series.

SUMMARY.

The report deals with 56 mental patients with pulmonary tuberculosis, who have received convulsive treatment, and who have been closely followed before and after the treatment. In 35 of these cases the pulmonary condition showed no change following convulsive treatment, and in 9 there was definite improvement. In the remaining 12 cases there was aggravation of the tuberculous process, but in 9 of these patients the aggravation occurred so long a time after the conclusion of the treatment that a causal connection is most unlikely. There remain three cases in which the possibility exists that convulsive treatment has had an unfavourable effect upon pulmonary tuberculosis. This is hardly more than might have been expected in tuberculous cases of this type, even without any convulsive treatment. It is therefore felt that pulmonary tuberculosis is no contraindication against convulsive treatment. In depressed and agitated patients, who are poorly nourished and generally difficult to manage, the pulmonary process will frequently benefit indirectly from the convulsive treatment because the mental state improves.

SOME OBSERVATIONS ON LEUCOTOMY AND INVESTIGATIONS BY PNEUMOENCEPHALOGRAPHY.*

By J. F. DONOVAN, M.R.C.S., L.R.C.P., D.P.M., A. J. GALBRAITH, M.D., D.P.M., and HARVEY JACKSON, F.R.C.S.

From Hurstwood Park Hospital Neuropsychiatric Unit, Hayward's Heath, Sussex.

PART I.—CLINICAL OBSERVATIONS.

Leucotomy studies are now commonplace and this preliminary report on the clinical aspects of our series has probably little to add to existing ideas on the subject. Neither the case material nor our initial approach to the problem differ fundamentally from the observations expressed by various workers at a meeting held at the Royal Society of Medicine on 9 April, 1946.

It is still doubtful, however, if sufficient evidence has yet been obtained to justify rigid conceptions regarding either the selection of patients or the prognostic criteria in any individual case. It is probable that the cardinal "good omens" might apply as with any other form of treatment in psychiatry, but one assumes that few patients with a really good prognosis have been subjected to the operation of leucotomy. We have certainly tried to maintain an uncompromising attitude in this respect and our cases have been selected from material for which no other method of treatment was feasible or where other methods had been unsuccessful. The majority of the patients were mental hospital residents, but a few (mainly obsessionals) had been admitted specifically for operation. Each case was discussed by us in conference to ensure full agreement that leucotomy was justifiable in the hope of relieving a distressing clinical situation.

The positive aspects of our selection are, of course, based on the fundamental hypothesis that the aim of the operation is to relieve emotional tension, and it is possible to divide the cases into two simple categories:

(1) Cases in which tension is obviously associated with distress on the part of the patient.

(2) Cases in which tension is expressed as disordered conduct.

The patients who are overtly distressed are the severe and obdurate depressives and obsessionals and those schizophrenics whose symptomatology is essentially paranoid. The conduct problems are mainly schizophrenics whose personalities show evidence of a variable degree of disintegration. The classification corresponds closely to the four groups distinguished by Cook (1946).

So far no direct reference has been made to the problem of personality in relation to selection and prognosis. On the whole we felt that the more reliable guide is the degree to which personality is affected by the illness and we have not attempted any detailed study of the patient's basic personality. It is frequently difficult, or virtually impossible, to distinguish between basic weak-

* Originally the subject matter of a report to the South-Eastern Division of the Royal Medico-Psychological Association at St. Francis' Hospital, Hayward's Heath, on 4 May, 1948.

ness in the personality structure, and findings which may represent the earlier stages of an insidious process. Furthermore, we are dealing mainly with chronic cases in which the information at our disposal is either inadequate or suffers from the bias imposed by interested parties, who invariably make too vivid distinctions between the past and present state of their unfortunate friends and relatives. Clinical assessment of the two main groups leads to the assumption that personality is relatively intact in the "distressed" patients and much more affected in the "conduct problem" group. Even so, in the latter there has not been complete surrender to the disease process which is still an actively disturbing influence.

The simple sub-division into "Distress" and "Conduct Problem" groups indicates roughly the type of patient and the corresponding need for leucotomy. Subsequent review of the series showed that without some elaboration it did not embrace every case satisfactorily, nor did it allow for sufficient gradation when assessing results in relation to other findings. Thus it did not distinguish between the members of the "Distress" group who showed relatively good preservation and those in whom there were some more definite signs of failure of personality. Likewise, although the majority of the "Conduct Problem" group was apparently disintegrated to an advanced degree, a few showed "islands" of preservation.

Based on overt clinical phenomena there were patients at one end of the scale who showed such features as intense and appropriate affect, preservation of thought and language, and at the lower extreme were those distinguished by symptoms such as apparent loss of affective responses, gross disturbance of language, blind impulsiveness, degraded habits, etc.

Irrespective of the original grouping into "Distress" and "Conduct" the patients were sub-divided into three somewhat empirical grades—A, B, and C, depending on the level they attained in this preservation-disintegration scale.

Bearing in mind these brief theoretical conceptions the actual case material under review should now be examined. This consists of a total of 80 patients (39 males, 41 females) on whom leucotomy has been performed between October, 1946, and April, 1948. Reference will be made to certain additional cases who have had the operation since the latter date, but which are not included in the preliminary review.

In tabular form the classification of these cases, including clinical groups and grade of personality assessment, is as follows:

TABLE I.

Personality grade.	Tension.											
	Distress.									Conduct problems.		
	Depressive.			Paranoid.			Obsessional.					
	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.
A	8	3	11	1	10	11	3	3	6	—	—	—
B	3	2	5	8	10	18	1	1	2	5	2	7
C	—	—	—	—	1	1	—	—	—	10	9	19

The distribution of the cases in this table is largely self-explanatory and according to expectations. It will be seen that, apart from one female patient,

all the "Distress" group are rated A or B in the personality preservation scale. The single exception is a woman who originally displayed a fairly florid paranoid psychosis, but had shown progressive deterioration and would probably have been left untreated but for the insistence of her relatives. Conversely it will be observed that nearly three-quarters of the "Conduct Problem" group are rated C, and the remainder no higher than B.

No exact statistical survey has been made, but in comparing the two sexes such items as age groups and duration of illness seemed to correspond fairly closely. It will be noted from Table II that over 50 per cent. (i.e. a total of 44) of the cases are of 10 or more years' duration.

TABLE II.

		Average age.		Duration.					
				Under 1 yr.	1-2 yrs.	2-5 yrs.	5-10 yrs.	10+ yrs.	
Distress	Depressive	M.	55	1	2	1	1	6	
		F.	52	1	—	1	1	2	
	Paranoid	M.	44	—	—	2	1	6	
		F.	49	—	—	4	8	9	
	Obsessional	M.	35	—	—	—	1	3	
		F.	33	—	—	—	1	3	
Conduct		M.	34	—	3	1	2	9	
		F.	41	—	—	1	4	6	

In assessing results in this series it must be emphasized that this is merely a preliminary survey and no attempt will be made to compare results with other series. There are, however, several points which may be of interest :

Method of recording progress.—We have found it convenient to employ a simple scale of numeral ratings which range from 0, indicating no improvement, to 5, implying recovery. It must be clearly understood that these ratings have no exact definitive value. In assessing improvement the selection and classification of cases and the immediate aims of the operation must influence the criteria on which the results are determined. Subjective relief is obviously a major issue in relation to distressed patients, while ease of management is of equal importance in the cases which are classified as conduct problems. The lower ratings in the scale mainly denote symptomatic improvement, so that the results in the various clinical groups are not strictly comparable, but as the scale is extended towards social recovery a common significance emerges.

Results.—As might be expected, the best results were obtained in the depressive group, although two patients in this group who had made good remissions subsequently relapsed completely. The paranoid group showed a tendency to improvement up to a point, while the results in the obsessional group were variable and, on the whole, are disappointing. The degree of improvement recorded in a fair proportion of the conduct problem cases is a most gratifying feature. Some of these patients surpassed our hopes and showed progress beyond a mere reduction of their behaviour difficulties.

The general pattern of reponse in the various groups is conveniently illustrated by means of a table (Table III) which shows the peaks reached in terms of the numerical ratings previously mentioned. If these results are examined along with the pre-operative personality grades it will be seen that in certain instances considerable doubt must arise with regard to the accuracy and

validity of purely clinical assessment. It is fair to state that clinical expectations were, for the most part, fulfilled in the depressive group in that all but one of the cases with an A personality grading made much more satisfactory progress than those graded B. In the paranoid group, however, there is little to choose between A and B grades, and the conduct problem group seem to provide the outstanding example of discrepancy between personality grades and the degree of improvement.

TABLE III.—*Progress Peaks.*

		Died.	0.	1.	2.	3.	4.	5.
Depressive	A	1	—	1	—	—	4	4
	B	—	1	1	1	—	1	—
	C	—	—	—	—	—	—	—
Paranoid	A	1	—	1	3	4	1	1
	B	—	2	3	6	5	1	1
	C	—	1	—	—	—	—	—
Obsessional	A	—	1	1	1	2	1	—
	B	—	—	—	—	1	—	—
	C	—	—	—	—	—	—	—
"Conduct"	A	—	—	—	—	—	—	—
	B	—	—	2	3	1	—	1
	C	—	4	4	5	4	2	—

Duration of illness.—There would appear to be no clear correlation between duration and progress, but only three patients who had been ill for more than ten years were ever rated as "recovered." Of these, two (depressives) subsequently relapsed, but one paranoid patient who made a belated remission, has, so far as is known, remained well since leaving hospital. On the other hand, among the conduct problems, several patients who had been ill for more than five years, made surprisingly good remissions.

Pattern of response.—The findings in this series once again illustrate that improvement may be gradual and extend over many months, and in a few schizophrenics improvement was first noted after a latent period. The clinical histories in these latter cases did not suggest that the delayed response might have been spontaneous. In the depressives the response is usually more immediate.

Repeat operations.—In this series we have one intriguing example of the effects of a second leucotomy. The case was that of a male schizophrenic, classified as a conduct problem, who showed a great deal of tension without gross disintegration. The first leucotomy had no effect, but a second operation, performed two years later, produced immediate relief. The only persisting symptom of any significance was the occurrence of brief destructive episodes which seemed just as puzzling to the patient as to ourselves. It was eventually decided that these attacks might be of the nature of epileptic variants. They ceased after epanutin had been prescribed.

TABLE IV.—*C.N.—Progress Chart.*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1944	.	.	.	.	.	.	.	.	L	1	0	0
1945	.	0	0	—	0	—	0	—	—	0	0	—
1946	.	0	—	—	0	0	—	—	—	0	0	L
1947	.	3	3	3	3	3	3	3	3	3	3	5
1948	.	5	—	5								

L = Leucotomy.

Vegetative functions.—As part of the routine investigation we have been studying some of the apparent alterations in vegetative functions after leucotomy. So far the most interesting finding, and perhaps the item of most practical significance, has been the changes in blood pressure and their possible relationship to kidney function. A fall in blood pressure seems to be invariable, but there is a great deal of individual variation in the degree and duration of this change. The lowest level is generally recorded about the third or fourth day after operation. Frequently the fall seems to be in direct proportion to the pre-operative level, i.e. the most extensive lowering of systolic pressure generally occurs where the initial reading is comparatively high. The duration of these changes is again subject to considerable variation. In some cases the pre-operative pressure may be regained in a comparatively short time, in others it is attained several months after the operation, and in some cases in this series the pre-operative pressure has not yet been re-established.

Another post-operative finding, which again is by no means consistent, is a rise in blood-urea level, which commonly reaches a peak about the third or fourth day. Rise of blood urea has been reported by Cumings (1942) in relation to head injuries. This author postulates a specific toxic factor arising from brain tissue damage and exerting its effect on the renal tubules. The relationship between the rise of blood urea and brain damage is again referred to in a later part of this paper.

At present it is impossible to be dogmatic about the mechanism of either of these findings in our series or to do more than speculate about their conceivable relationship. It can be stated that in some cases the post-operative fall in blood pressure is not accompanied by any rise in blood urea, in others a moderate rise is encountered and in a few instances very high urea levels are reached. Perhaps the most striking example occurred in a female patient whose kidney function had not been suspect until she developed a post-operative fatal uraemia (Fig. 1). Post-mortem revealed an advanced bilateral pyelonephritis. Although impairment of kidney function may be due to Cumings' toxic factor, it is equally reasonable to postulate that it is secondary to the lowering of the blood pressure. It is possible that if there is any pre-existing renal inadequacy it will be unmasked by the fall in blood pressure. The fall in blood pressure as already mentioned, frequently persists for a long time after operation (when any immediate traumatic-toxic factors must have resolved), which certainly suggests that autonomic vaso-motor centres have been affected by leucotomy.

Control of bladder function was interfered with in many of the patients in this series. Broadly speaking, the majority were incontinent for a variable time after operation. There were some who did not appear to be aware of the state or action of their bladders, and others whose incontinence was due to apathy or laziness. Many similar observations have been made in the past, but there may be still further aspects to consider. We have, for example, been puzzled by certain cases in which incontinence did not develop until some days after operation. Partial dehydration may have been a factor, but unfortunately we have no details of actual output in these cases. All that has been noted is that certain patients who used the bed-pan satisfactorily for a

day or two subsequently became incontinent. Another enigma is the incontinent patient who, after leucotomy, eventually becomes dry in habits without showing any significant improvement in other directions. While intensified nursing attention may be a possible explanation of this latter phenomenon, our observations do not suggest it to be so in every instance.

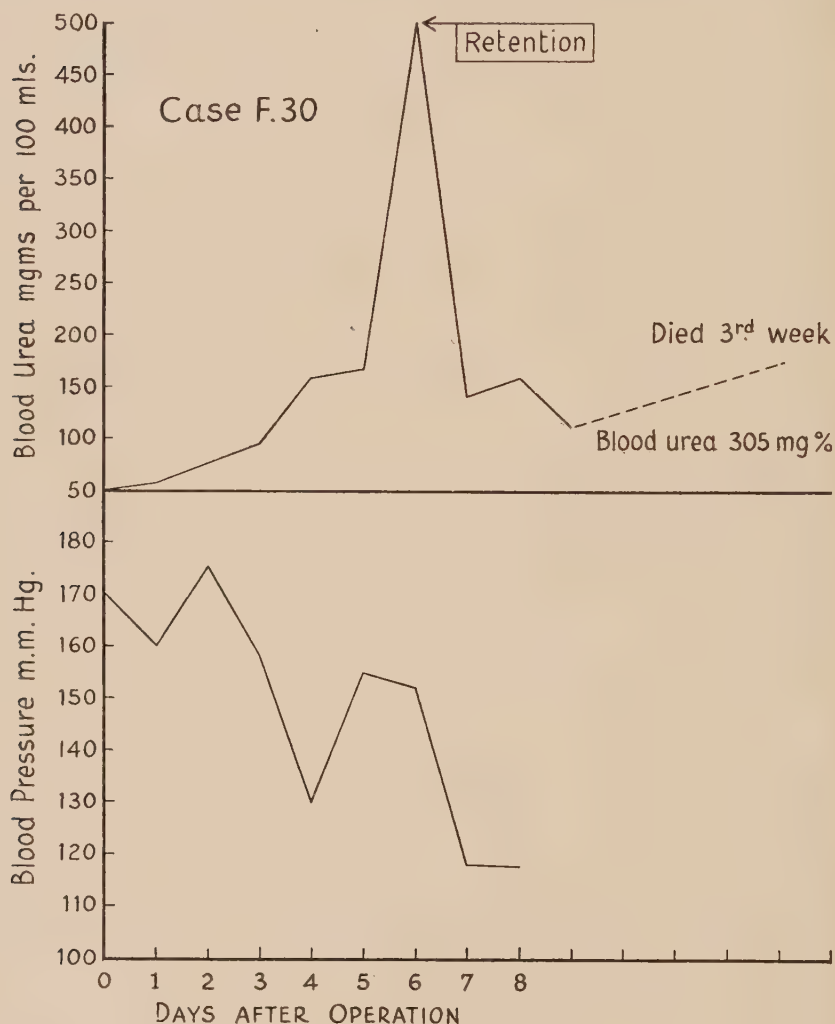


FIG. 1.

Following leucotomy, gain in body weight, often associated with an obvious increase in appetite, has been noted in over half the cases of the series. There is no constant relationship of these findings to mental improvement and their incidence is no less common among those who failed to make significant progress. This might suggest that they are direct results of changes in vegetative centres.

A further communication on these physical aspects of leucotomy is contemplated when certain additional investigations have been completed.

Fits.—A small percentage (4 per cent.) of our patients developed epileptiform convulsions at varying intervals after operation. Our findings in this direction are in keeping with other reports, and do not require special comment.

Deaths.—In this series there have been only two deaths. In both cases uraemia developed. In the first, which has already been discussed, death occurred three weeks after the operation and was due to chronic pyelonephritis. In the second, death occurred seven days after the operation and was due to intracerebral haemorrhage in the region of the leucotomy, and although the blood urea reached a figure of 440 mgm. per cent. the kidneys were normal.

The concluding remarks on this clinical review are mainly concerned with introducing the second part of the investigation. It will have been apparent that in depressive patients and paranoid schizophrenics the results can be understood in terms of reduction of affective disturbance. In the former the affective disturbance is the essential reaction of the illness, whereas in the latter it constitutes only one aspect. Thus, while complete relief may be accorded to a case of pure depression, the same degree of improvement is unlikely to occur in one of paranoid schizophrenia.

These views are in keeping with existing conceptions of the mechanism of leucotomy, and merely emphasize the fact that where emotional tension is directly apparent as affective symptoms, it should be feasible to forecast the progress in most instances. On the other hand, the response in the sort of case which we have classified as "conduct problem" is much more problematical, as our results will have shown. It was therefore considered that, especially in relation to the latter group, fresh evidence must be sought from other sources. With this in view one of us (J. F. D.) began an independent investigation by means of pneumoencephalography, and in describing the results of this study, an attempt will be made to relate them to the clinical findings.

PART II: INVESTIGATION BY PNEUMOENCEPHALOGRAPHY.

The existence of cortical atrophy* in schizophrenia as demonstrated by pneumoencephalography was first reported by Jacobi and Winkler (1927, 1928) and additional reports have come from many sources since then (Moore, 1935; Semrad, 1943; Delay, 1945). Lemke (1935), who studied a series of cases, found that those with the greatest personality disorder occurred in a group showing the greatest ventricular enlargement. That these changes have not received the attention which they probably deserve may be due to the absence of clearly defined histopathological changes to account for them. However, the existence of atrophy in the brain of patients suffering from chronic schizophrenia has been amply supported by observations made by the neurosurgeon during the operation of leucotomy. Often the brain is shrunken from the dura or the sulci are filled with an excess of fluid and the ventricles feel dilated as the exploring needle is inserted. These changes observed at operation, especially those in the cortex, correlate fairly well with those seen in the encephalograms of the same patients.

* The use of the term "cortical atrophy" is not intended in the true histological sense, and possibly "cortical shrinkage" would be more appropriate.

The present encephalographic investigations concern two groups of patients. Group I consists of a series of 19 patients of whom 12 had a further encephalographic study after the operation of leucotomy. Group II consists of 17 patients who had already had a leucotomy operation prior to the commencement of this investigation.

Of the total of 36 patients (18 male and 18 female) who have had encephalograms done, all were suffering from schizophrenia of a duration extending from 2 years to 29 years. Their ages ranged from 16 to 66 years. Seventeen had received other physical treatments (insulin, cardiazol or E.S.T.) previously and 19 had had no physical treatments.

The cases in Group I all show some degree of abnormality in their encephalograms. These abnormalities consist in some of a gross degree of enlargement of the ventricles without any abnormal surface air markings; in some there is a considerable widening of the sulci and of the cisterns, with only minor degrees of enlargement of the ventricles, while in others a combination of both changes is in evidence.

The findings are tabulated below in relation to the age of the patients and the known duration of the schizophrenic illness. An estimate of enlargement of the lateral ventricles was made, and subsequently checked against the ventricular index (Evans, 1942) calculated for each of the encephalograms. In the table there are three grades which compare with the ventricular index as shown.

TABLE V.

Group I. Case No.	Age.	Duration in years.	Degree of enlargement of lateral ventricles.		Ventricular index.				Previous treatments.
			—	+	Less than 0.30 (normal average 0.23).	0.30 to 0.32.	0.33 to 0.35.	Abnormal appearance of cortical air.	
16	60	4+	—	+	—	+	+	+++	—
4	54	12	+	—	+	+	+	+	EST
33	54	15+	++	+	+	+	+	+	—
8	52	15+	+	+	+	+	+	+	—
5	52	2	+	+	+	+	+	+	—
12	50	29	++	—	+	+	+	+	—
26	48	29	+	+	+	+	+	+++	—
17	47	10+	++	—	+	+	+	+++	—
3	45	11	++	—	+	+	+	—	—
10	44	13	+	+	—	+	+	++	—
13	40	8	++	+	+	+	+	—	—
32	38	15	+	—	—	—	+	+	—
1	37	15	++	+	+	+	+	+	—
6	32	10	+	—	+	+	+	+	C
34	30	11	—	—	—	—	+	+	C
18	30	7	++	+	+	+	+	+	I
29	29	3	+	+	+	+	—	—	I
2	24	3	+	—	+	+	—	—	EST I
9	16	5+	—	—	—	—	+	+	I

EST = electro-shock treatment; I = insulin shock treatment; C = cardiazol shock treatment.

The series of patients examined is too small to make any general deductions from the results, but it can be seen that while none of the patients exhibit an

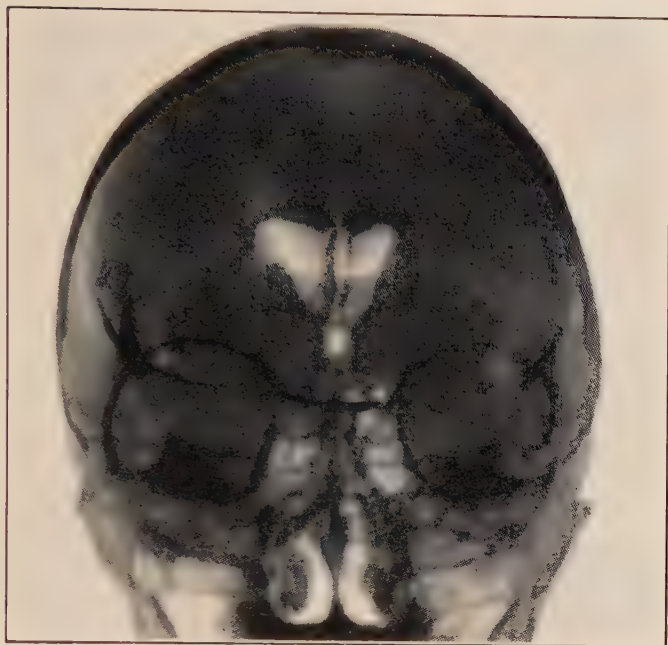


FIG. 2a.

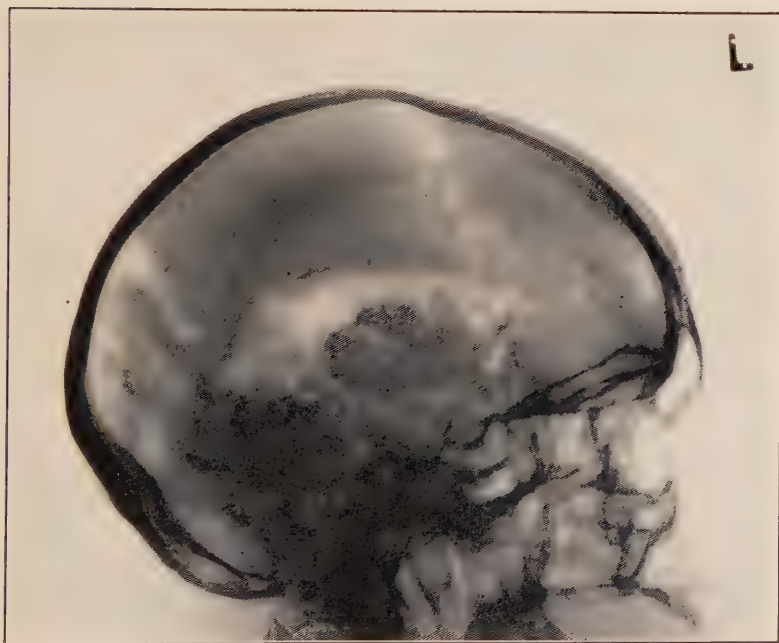


FIG. 2b.

CASE 26.—Age 48. A deteriorated schizophrenic whose illness commenced at 19 years, but who had a remission for 12 years. Abnormal cortical gas markings in parieto-temporal regions with unequal enlargement of ventricles.

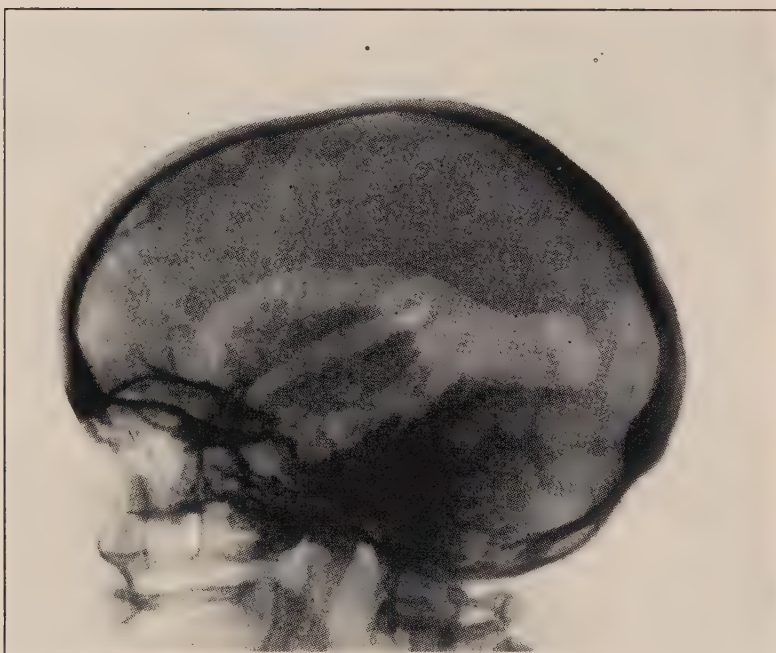


FIG. 3.

CASE 17.—Age 47. A deteriorated schizophrenic with onset of illness at age 38. Encephalogram shows enlargement of lateral ventricles and basal cisterns with accumulation of gas along left Sylvian fissure.

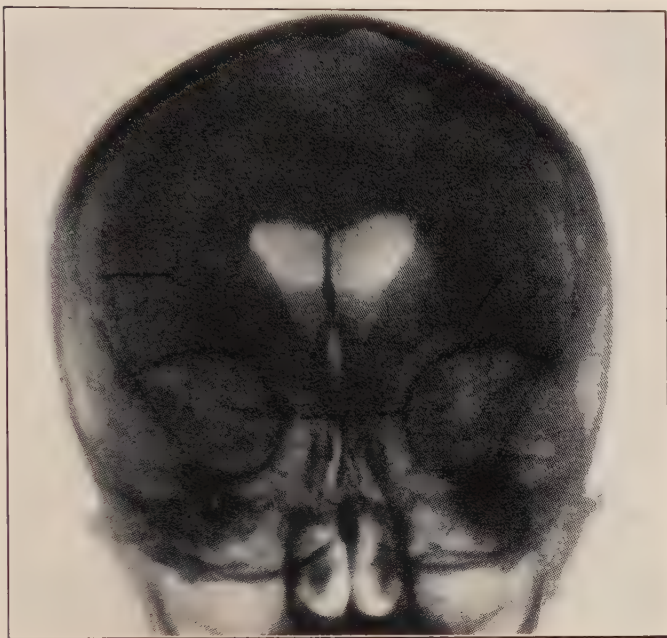


FIG. 4a.

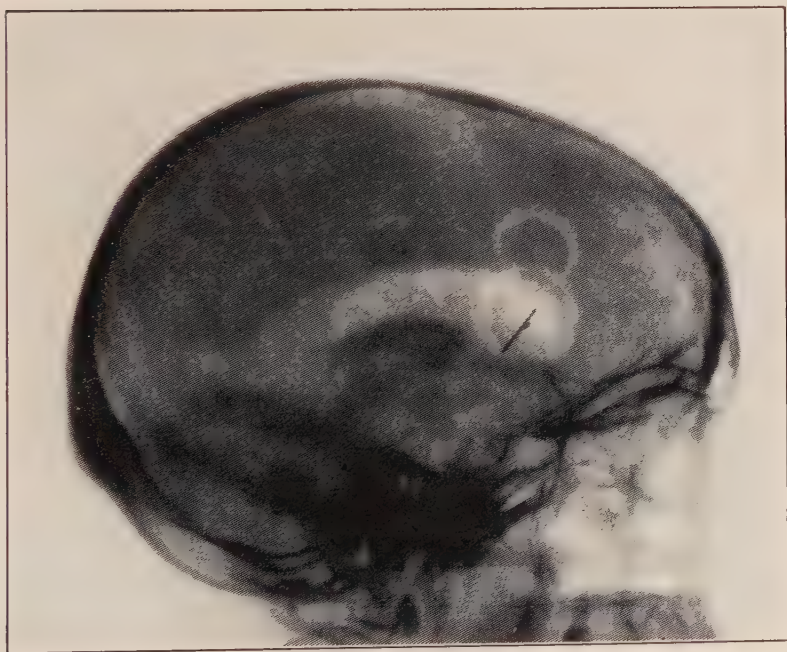


FIG. 4b.

CASE 5.—Views showing relation of leucotomy markers to lateral ventricles.

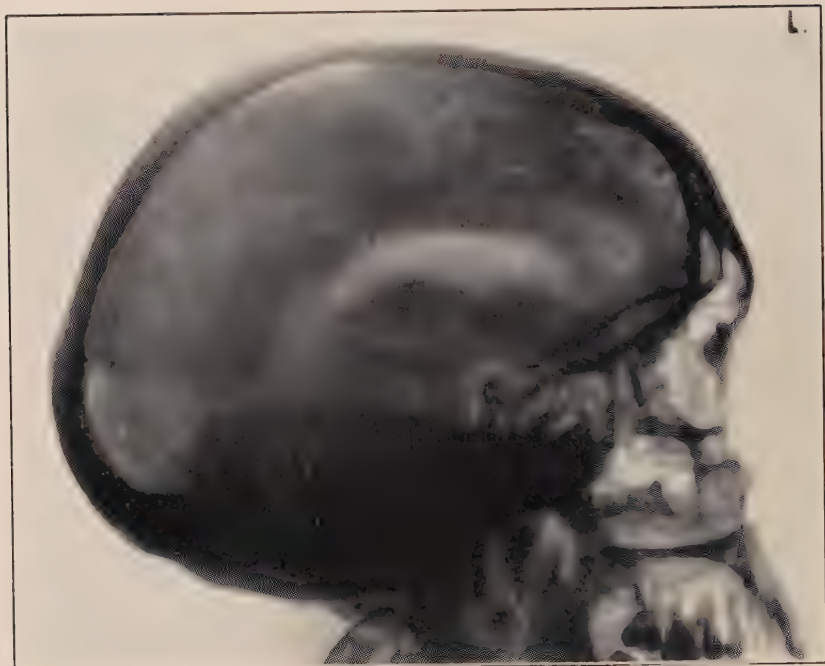


FIG. 5a.

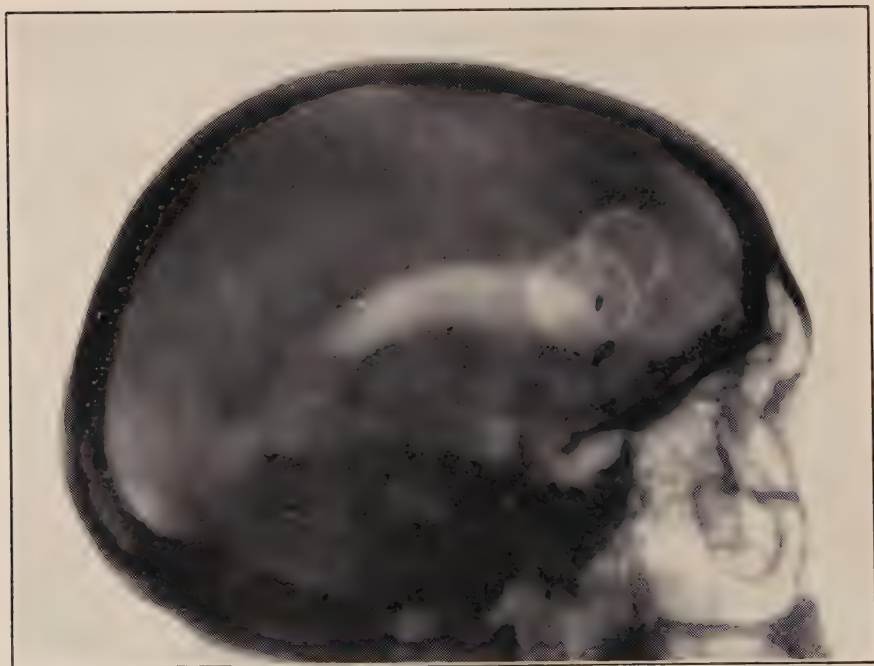


FIG. 5b.

CASE 13.—Age 40. A moderately well-preserved schizophrenic with onset of illness at age 32. Encephalograms before and after leucotomy show little change. (*a* is not quite a true lateral picture.)

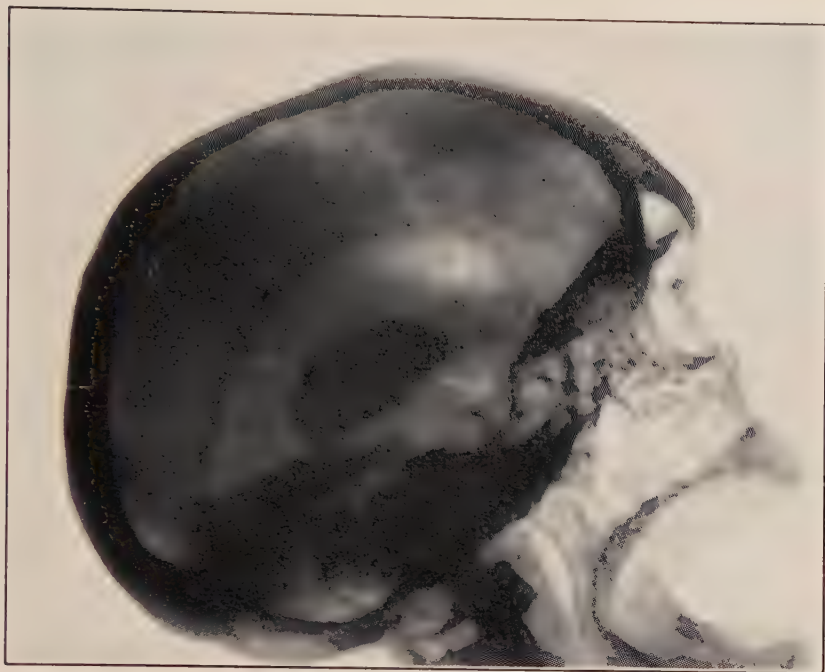


FIG. 6a.

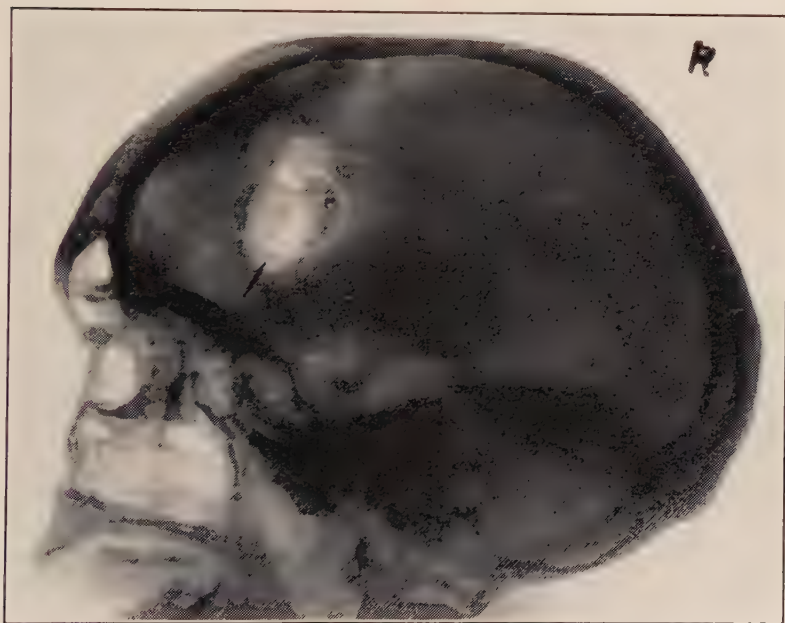


FIG. 6b.

CASE 12.—Age 50. A deteriorated schizophrenic with onset of illness at age 21. Encephalograms before and after leucotomy showing cavitation in communication with the right lateral ventricle after leucotomy (only 1 leucotomy marker used in this case). In the A.P. views (not shown) increased dilatation of the lateral ventricles is also evident in the post-leucotomy encephalogram.

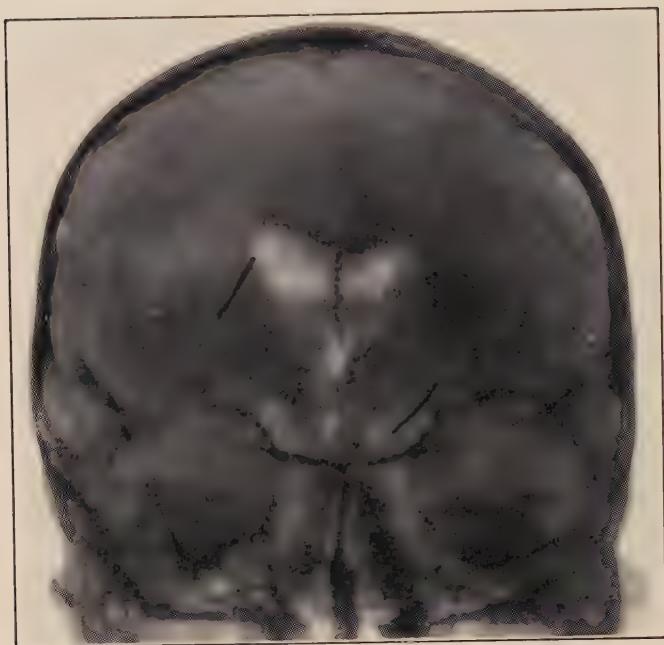


FIG. 7a.

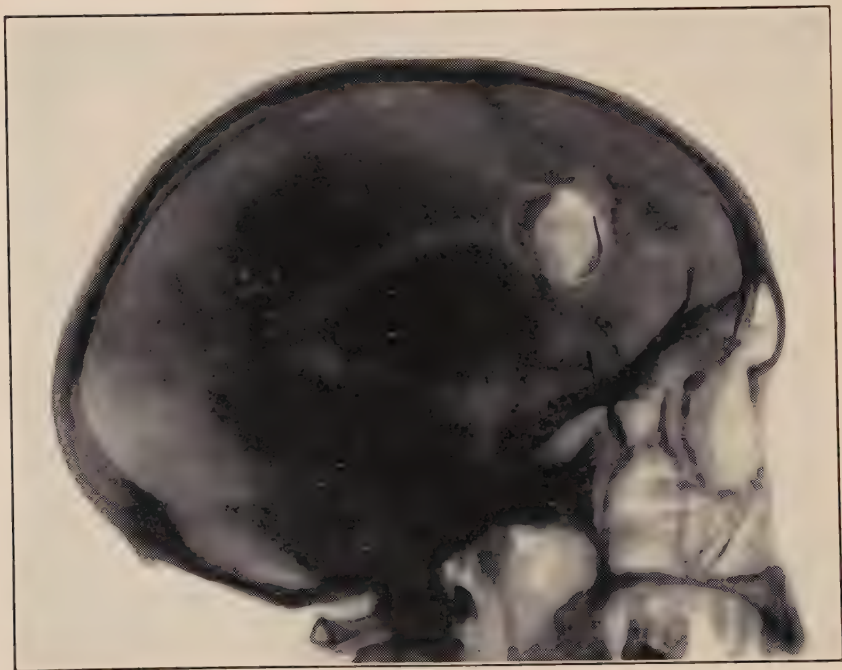


FIG. 7b.

CASE 16.—Cavitation on both sides communicating with lateral ventricles. The left leucotomy marker has slipped downwards and appears to be in the cavity on that side.

entirely normal encephalogram the most severe abnormalities tend to be found among the older patients who have a correspondingly longer duration of illness. Most of these older patients have not been given any of the modern physical treatments and this must be taken into account when considering the possibility of atrophic change being a result of physical treatments.

Relation to Progress.

It seems important to establish whether the existence of atrophic cortical lesions as revealed by the encephalogram has any bearing on the progress of the case subsequent to leucotomy. For various reasons it would be premature to form any conclusions from a study of the few cases in Group I who subsequently had a leucotomy operation, although it is perhaps significant that Case 34 (Table V) showed least abnormality in the encephalogram and has improved sufficiently to be discharged home. The other eleven cases all had more marked changes in the encephalogram and at the most exhibit only minor degrees of improvement following the operation.

In cases belonging to Group II, where an encephalogram was made only after the operation of leucotomy, it is impossible to distinguish with certainty between the changes in the encephalogram which can be ascribed to the operation and signs of a pre-existent atrophy. However, the cases are shown in Table VI and an attempt has been made to grade them according to the severity of atrophy shown in the encephalogram although it may well be that some of the cases have been placed in too advanced a grade as a result of general atrophic changes brought about by leucotomy. It is of interest to note that all the major degrees of improvement following leucotomy occur in the first and second grades.

TABLE VI.

Grade I.		Grade II.		Grade III.	
Case No.	Progress.	Case No.	Progress.	Case No.	Progress.
15	5	21	4	20	2
27	3	11	2	30	2
28	2	22	1	24	1
7	2	36	1	25	1
14	0	19	1	23	0
..	..	31	0	..	..
..	..	35	0	..	..

Plane of Leucotomy.

Dilatation and inequality of the ventricles were both common findings before leucotomy and it is important that this should be realized, as it cannot be assumed that the lateral ventricles, and in consequence the fronto-thalamic radiations, bear a normal relationship to the surface markings of the head in these patients. For this reason it was felt that any estimates of the plane of the leucotomy section made with reference to the coronal suture line were of doubtful validity. At operation the plane of the leucotomy was marked by the insertion of a small length of silver wire into the cut through the white matter. In encephalograms made subsequently the relationship of the plane of the leucotomy to the anterior horns of the lateral ventricles has been esti-

mated by taking several different views, including in many cases stereoscopic pictures. The result of this investigation shows that throughout the series the position of the leucotomy markers varies from just anterior to the tips of the anterior horns of the lateral ventricles to a position well posterior to them.

These variations are summarized in Table VII, and an attempt has been made to correlate the place of section with various features of the progress of the case after operation. The greatest degree of clinical improvement occurred in the two cases with more posterior cuts, but there is a wide individual variation and no constant correlation between the plane of the cut and clinical improvement is evident. Persistent incontinence of urine and a significant fall in blood pressure, either of a duration of more than one month, are also recorded in the table. Although Ziegler and Osgood (1945) came to the conclusion that there was some evidence that a more anterior leucotomy is attended with less incontinence, they admitted that their findings showed only a poor correlation. It is clear that in the present series there is also an absence of a definite relationship between the plane of the leucotomy on the one hand and disturbance of bladder function and vasomotor control on the other. None of the cases developed oedema of the legs after the operation, as described by Ziegler and Osgood, and only one case, No. 14, was complicated by a trophic change in the skin.

Since the operation one case (No. 31) had a very persistent attack of hic-cough and on another occasion had signs of cardiovascular collapse with brady-cardia. There were no local lesions to account for these attacks. Although

TABLE VII.

Case No.	Position of leucotomy markers relative to extremity of anterior horns of lateral ventricles.						Final degree of clinical improvement.	Persistent urinary incontinence beyond 1 month.	Fall in systolic B.P. of 10 mm. Hg. and over persisting beyond 1 month.
	Anterior.		Level.		Posterior.				
22	R.	L.	.	..	.	..	1	+	0
13	R.	L.	.	..	.	..	1	0	+
27	..	L.	.	R.	..	..	3	+	+
28	..	L.	.	R.	..	..	1	+	+
11	..	.	.	R.	L.	.	2	0	—
20	..	.	.	R.	L.	.	2	0	0
24	..	.	.	R.	L.	.	1	0	0
23	..	.	.	R.	L.	.	0	0	+
36	..	.	.	R.	L.	.	1	0	+
31	..	.	.	R.	L.	.	0	0	+
26	..	.	.	R.	..	L.	0	+	+
19	..	.	.	R.	..	..	0	0	+
16	..	.	.	R.	..	L.	0	0	..
34	..	.	.	..	L.	R.	3	+	+
10	..	.	.	..	L.	R.	0	0	+
30	..	.	.	..	L.	R.	1	+	+
4	..	.	.	..	L.	R.	1	0	+
12	..	.	.	..	L.	..	1	+	+
5	..	.	.	..	.	R.	2	0	0
1	..	.	.	..	.	R.	2	+	0
8	..	.	.	..	.	R.	2	0	0
21	..	.	.	..	.	R.	4	0	0
15	..	.	.	..	.	R.	4	0	+
14	..	.	.	..	.	R.	0	+	+
25	..	.	.	..	.	R.	1	+	+
2	..	.	.	..	.	R.	1	+	+
35	..	.	.	..	.	R.	0	0	+
18	..	.	.	..	.	L.	1	0	0

autonomic disturbances are not uncommon in catatonic schizophrenics it is possibly of significance that in this patient one of the leucotomy markers appears to have moved to occupy a position partially within the lateral ventricle.

Effects of Leucotomy on the Encephalogram.

When the pre- and post-operative encephalograms were compared some of the cases showed little change or changes, confined to a slight enlargement of the frontal horns of the lateral ventricles. Others showed evidence of severer damage, such as large cavitations or deep cortical depressions in the region of the leucotomy cut, or even a generalized dilatation of the ventricles. Although those showing evidence of more severe brain damage were of a higher average age, there were among them two patients whose ages were below the average of those showing little or no change. In all cases the technique of operation was identical. Daily blood urea estimations were made on ten of them during the first week following operation and the rise in blood urea above the pre-operative level is recorded. Each of the patients had a blood urea within normal limits prior to operation. In this series it would appear that there is a certain amount of correlation between the amount of brain damage following leucotomy and the rise in blood urea post-operatively.

TABLE VIII.

With evidence of only minor brain damage.			With evidence of severe brain damage.		
Case No.	Rise in blood urea in mg. per cent.		Case No.	Rise in blood urea in mg. per cent.	
8	.	1	2	.	11
13	.	0	16	.	6
34	.	0	4	.	17
10	.	10	5	.	7
..	.	..	26	.	14
..	.	..	1	.	— Not recorded
..	.	..	12	.	— „

SUMMARY.

Part I of this paper relates the clinical aspects of 80 cases treated by leucotomy. The main features which have been discussed are :

1. *Selection and classification of case material.*—Two main groups were distinguished. In the first group emotional tension was obviously associated with distress on the part of the patient, and in the second emotional tension was expressed as disordered conduct.
2. *Post-operative progress.*—The results of the operation in the first group appeared to depend largely on the extent to which affective disturbances constituted the original clinical syndromes. The results of the operation in the second group were less comprehensible and indicated the need for further investigation.
3. *Post-operative alterations in vegetative functions.*—In this sphere particular attention was paid to changes in blood pressure and blood urea, and their

possible relationship to kidney function. Various aspects of the problem of post-operative urinary incontinence were also discussed.

Part II is an attempt to throw further light by means of pneumoencephalography on certain of the problems arising under these headings. It correspondingly embraces the following points:

1. *Cortical atrophy in schizophrenia.*—Its existence has been demonstrated in a number of cases, the most severe abnormalities being found among the older patients with a longer duration of illness.

2. *Correlation of findings with clinical results.*—There appears to be some relationship between the degree of atrophy and the post-operative progress in the second clinical group.

3. *Relationship of leucotomy structural changes to alterations in vegetative functions.*—There was no clear relationship between the plane of leucotomy and vegetative changes. The occurrence of cavitation was noted and it appeared to be associated with a greater post-operative rise in blood urea in some cases.

We wish to thank Dr. W. McCartan, Medical Superintendent of St. Francis Hospital, for his encouragement and advice and for permission to publish. We are also indebted to Mr. R. F. Nunn, Biochemist to the hospital, who was responsible for the laboratory investigations. We also thank all the other members of the staff who have given their assistance.

REFERENCES.

- COOK, L. C. (1946), *Proc. R. Soc. Med.*, **39**, 449.
 CUMINGS, J. N. (1942), *J. Neurol. et Psychiat.*, **5**, 40.
 DELAY, J., DEVU, P., *et al.* (1945), *Rev. Neurol.*, July-Aug., 374.
Idem (1945), *ibid.*, 377.
 EVANS, W. A. (1942), *Arch. Neurol. Psychiat.*, **47**, 931.
 JACOBI, W., and WINKLER, H. (1927), *Arch. f. Psychiat.*, **81**, 299.
Idem (1927), *ibid.*, **84**, 208.
 MOORE, M. T., NATHAN, D., *et al.* (1935), *Amer. J. Psychiat.*, **92**, 43.
 ROYAL SOCIETY OF MEDICINE (1946), *Proc. R. Soc. Med.*, **39**, 443-458.
 SEMRAD, E. V., and FINLAY, K. H. (1943), *Psychiat. Quart.*, **17**, 76.
 ZIEGLER, L. H., and OSGOOD, C. W. (1945), *Arch. Neurol. Psychiat.*, **53**, 262.

AUDITORY, OLFACTORY-GUSTATORY AND THERMIC RORSCHACH RESPONSES.

By E. WELLISCH, M.D., D.P.M.,

Psychiatrist, Kent Education Committee.

ONE can arrange the determinants of Rorschach responses in the following groups, according to the sense impression which they convey :

An optic sense impression only is given by the form-, colour- and vista-responses (F, C', FC, CF, C, FK, K, k responses).

A kinaesthetic impression is conveyed in addition to the optic one by the movement responses (M, FM, m responses).

A tactile and optic impression is conveyed by the texture responses (c, cF, Fc responses).

In this grouping no place is given to the auditory, olfactory-gustatory and thermic responses because they are so far not recognized as having specific significance. The reason for this omission probably is that these responses usually occur together with movement responses and are scored as such.

It is of considerable interest, however, to study responses with auditory, olfactory-gustatory and thermic impressions. By doing so one will find that they sometimes have a special character which may be valuable as a refinement in the scoring and assessment.

This study is a survey of 80 records of children between the ages of 8 and 14. Two interesting records of adults were also used.

AUDITORY RESPONSES.

Auditory responses occurred in about every fourth record. In one third of the cases which showed auditory responses more than one such response was given.

All auditory responses were conceived in conjunction with a movement response which was a M, FM or m response. On closer study one could differentiate between two categories of these responses.

In the first category the emphasis of the response lies so much on the movement that the auditory element is noticed only slightly or not at all.

Examples for this category are the following responses :

To card II : "Clowns clapping their hands together."

To card III : "Mermaids talking to each other";

or : "Black people playing a drum."

To card VI : "A lighthouse and splashing water."

To card VII : "Talking pussies";

or : "Two puppy dogs barking at each other";

or : "Ladies speaking to each other."

The "clapping" of the clowns' hands for instance was imagined so vividly as a movement that the idea hardly arose that clapping is also an acoustic phenomenon. True, the clapping gave the response a certain extra vividness, but this did not alter its scoring as a typical M response. The same applied to the "talking," "barking," "splashing," etc., which are all scored as movement responses irrespective of their additional auditory element.

The second category of auditory responses has the emphasis on the auditory phenomenon. The movement element, however, retains its importance although it is less dominant than in the first category.

These responses are examples :

To card I (centre white space detail) : "A lady singing an unkind song." This response was given by a girl who had a very ambivalent attitude towards her mother. The girl loved "the songs" of her mother but suffered intensely because they appeared to her to be "unkind." It was probably significant that the lady "sang" and not just "talked," for song and music are able to express deepest emotions. There is a formal element in the card which acted partly as a stimulant for the response ; some of the tiny dots in the white space, outside the lower part of the blot, have the appearance of musical notation.

To card I (reversed position, whole blot) : "Chinese pagoda, a house or temple. High strange music . . ." This response was of special interest, as there were no persons mentioned who produced the music, and also on a painting which was made of the response only the three rhythmically built stories of the pagoda were shown, but no people. The music was imagined to emanate from the interior of the temple, as an inanimate force. It represented an inanimate movement in so far as sound is an undulating movement of air. It was a pure acoustic response which was independent of moving figures. The response was given by an adolescent, depressed girl who suffered from severe stammer. She was in a trance-like emotional state, and the response expressed her religious longing for a higher life.

To card I (whole blot) : "The head of a prehistoric, carnivorous monster. It was in a combat and here is blood : drip, drip, drip!" The response was given by a very withdrawn boy who was obsessively absorbed in nature studies. In this respect he followed his father, of whom he was very afraid. The boy made a painting of the monster on which the sinister character of the dripping blood was vividly shown.

To card II : "The inside of the body, in the middle where it makes me wheeze !" This response was conceived by an asthmatic boy who was terrified by his attacks of dyspnoea and wheeziness.

To card VI : "Earthquakes on an island. Thundering noises ; it is dangerous; the earth gives way." The boy who gave this response was a delinquent who was frightened of his own aggressiveness and feared to lose his mother's love. This made him very insecure.

To card IX (upper orange details) : "It could be dragons roaring at each other." The little boy who gave this response was very emotional when he mentioned the "roaring." He suffered from a personality change following polioencephalitis, and had outbursts of fury during which he mainly attacked his father. When the boy made a crayoned picture of the response he painted

a fiery breath which came out of the dragons' throats in order to demonstrate the "roaring."

To card IX (middle green detail): "The north wind blowing. It is the strongest and most fierce of the four winds." The response was given by a schizoid girl who was morbidly attached to her father. He was a powerfully built policeman.

To card X (lower yellow detail): "A little bird singing on a branch. It is happy." The response was an expression of the improvement of a boy who had suffered from depression and had been successfully treated. A painting of the response demonstrated the happy mood of the little bird as he was singing on a lovely branch (*cf. Journ. Ment. Sci.*, April, 1949).

All these responses had a highly emotional character which was appropriately expressed by the choice of auditory impressions. The emotional charge is a characteristic of this category of auditory responses.

The responses were either M or FM or m responses; their emotional charge, however, gave them an unusual intensity or quantity of vividness. The quantity principle or "valence" of a response deserves a special study. The emotional intensity of movement responses varies greatly, and the auditory element points in a number of cases to a high emotional charge. As a matter of interest it may be mentioned that in movement responses also another scale of quantitative differences can be distinguished, i.e. the scale of the extent and tempo of the movement. A movement can be represented by a "posture," like the attitude of sleeping, or a "slow movement" like walking or a "quick movement" like dancing.

The following considerations show that auditory responses have still another significance: Rorschach responses can be due either to the erroneous interpretation of the actually seen inkblot—this means to illusions; or they can be sense impressions without real external stimulus—that is, hallucinations.

Purely illusionary responses are the "optic" responses—that is, the form-, colour- and vista-responses.

Hallucinatory (and illusionary) responses are the "kinaesthetic" or movement responses, and to a certain degree the "tactile" or texture responses.

The fact that movement responses are regarded as indicating imagination or inner promptings is due partly to their hallucinatory character—that is, to their origin, even without any external stimulus.

Auditory, as well as olfactory-gustatory and thermic responses, are also of a hallucinatory nature. They point therefore to the presence of phantasy, and add weight in favour of the assessment of an introverted experience type.

OLFACTORY AND GUSTATORY RESPONSES.

These responses are very rare. It is perhaps significant that when they occurred either auditory or thermic responses were conceived as well.

An olfactory response was contained in the response which the girl gave who saw the pagoda in card I. Her full response was: "Chinese pagoda, a house or temple, perfumed with peach-blossom and incense. High strange music

. . .” Old memories of the girl came alive with this response, of dreams which she dreamt long ago and were awaiting fulfilment.

A boy imagined in card III: “Black men in Africa, bending over a pot, on a fire, stirring the stuff inside; oh, it smells like nice stew. This looks like a bone (centre red detail); they make a spell to see where it is hanging on; it is their ‘treasure,’ their ‘sign for dinner.’” When he made a painting of the response he added nice pineapples and a beautiful snake, “which was just passing by, but was not poisonous.” The boy suffered from encopresis and was beyond his mother’s control. He was highly imaginative and sensuous.

Another little boy imagined in card VII: “A dump where the dust carts tip all their dirty things out from people’s dustbin. It smells sometimes.” He made a painting of the dump. It showed, amongst other litter, a man’s broken walking stick—“the dustman threw it there”—and a lady’s washing bowl “with a hole in it.” A signpost was painted in the middle of the central white space with the inscription, “Keep off.” The sun was shining down on to the dump and made it smell. The little boy suffered from enuresis and was an extremely shy and dreamy child. He spoke with intense disgust about the dump, which might have been an unconscious symbolic expression of criticism of his surroundings.

An interesting gustatory response of an adult may also be described: A man saw in card X, “Lobster and salad,” which response was certainly determined by the pale orange and green colour of the card, which had an appetizing effect on him.

Olfactory sense impressions are evoked by small quantities of substances which are diffused and moving in the air, and it is therefore not inappropriate to score olfactory responses with the symbol *m*. The sense of taste is closely linked with that of smell, and gustatory responses can therefore also be regarded as *m* responses. If olfactory-gustatory impressions are attributed to a living person or animal they will be scored as *M* or *FM*.

The olfactory and gustatory element gives the response a special vividness and character. Phylogenetically the sense of smell is very old and is related to the function of memory. Irritations of the olfactory portions of the brain can, for instance, produce peculiar disturbances of memory as the “*déjà vu*” phenomenon, a sensation that what is happening has happened before, or the “panorama memory,” a feeling that one remembers a large part of one’s life in a very short time. Some of the olfactory Rorschach responses are likely to be related to old memories.

Many animals depend greatly on the sense of smell in their search for food and their sexual partner, and although in man the olfactory sense has ceased to play a dominant part, it is still linked with sensuality. The olfactory-gustatory responses of the Rorschach test seem to indicate in certain cases a strong sensuality in a person. They can convey a sensation of pleasure, as in the example of the perfume of the peach-blossom or the odour of the stew, or can express displeasure or disgust, as in the case of the stench of the dump.

As olfactory-gustatory responses have a hallucinatory character they point to inner promptings and an introverted experience type.

THERMIC RESPONSES.

Thermic responses are also rare. They are perhaps a little more common than olfactory-gustatory ones because some parts of the test cards are particularly liable to evoke thermic sensations, as, for instance, the lower centre detail of card III, which is often conceived as a pot over a fire.

A girl imagined, for instance, in response to this detail, "Two men warming their hands over a fire," or a boy, "Women warming themselves."

Another example of a thermic response was given by the boy who conceived the smelling dump. He said "The dump smells to-day because it is so hot" and he demonstrated the heat of the day on his painting of the response by making a large sun.

As thermic responses are rare I should like to add one such response from the record of an adult. It was given by a lady who suffered from involutional melancholia. She said of the upper central grey detail of card X: "Two moths clambering towards a lamp for warmth. They feel cold and want warmth. It could be winter time. If they have no warmth moths could die out." In this response was an emphasis on the thermic sensation. It expressed in a touching way the patient's feeling of coldness in the relationship between herself and her husband, and her unconscious fear of the approaching winter of life, and of dying in unhappiness unless a source of warming love be found. The flying of moths or birds towards a warming light is a motive not infrequently found in literature, symbolizing a longing for love.

Thermic responses occur together with human or animal movement impressions, but can, as the example of the "hot dump" showed, also be conceived without the presence of figures. In this case the inanimate force of warmth is the determinant. Warmth, according to physics, is movement of molecules which logically justifies its scoring as m.

The thermic element gives a movement response an increased emotional valence. Some of the thermic responses can be regarded as symbolic expressions of a feeling of coldness in human relationships or a longing for the warmth of love. Such an interpretation is, of course, only possible in connection with a full psychological exploration of a person.

Feelings of cold or warmth are hallucinatory sensations and a sign of phantasy.

CONCLUSIONS.

Auditory, olfactory-gustatory and thermic Rorschach responses occur in conjunction with movement responses, but deserve a special study.

There are two categories of these responses. In the first category the emphasis lies on the movement and in the second category on the auditory, olfactory-gustatory or thermic element.

Responses, especially of the second category, add to the intensity of the movement impression and give it a greater quantitative value or "valence" of experience.

Auditory responses often indicate emotionalism.

Olfactory-gustatory responses seem to point to sensuality and are in some cases related to old memories.

Thermic responses sometimes symbolize lack of or longing for love.

Auditory, olfactory-gustatory and thermic responses have a hallucinatory character, and therefore indicate the presence of inner promptings, phantasy and a tendency towards an introverted experience type.

The responses of the first category with the emphasis on movement are typical movement responses and are appropriately scored as M, FM or m responses. The responses of the second category, which have the emphasis on the auditory, olfactory-gustatory or thermic sense impression, however, need a special consideration. They can be distinguished from the first category by an experienced Rorschach worker as well as a FC response from a CF response. Because of the before-mentioned reasons it appears to be desirable to differentiate between the two categories in the scoring.

I should like to propose the use of the following scoring symbols for the distinction of the second category :

For auditory responses : Ma, FMa, ma.

For olfactory responses : Mo, FMo, mo.

For gustatory responses : Mg, FMg, mg.

For olfactory-gustatory responses : Mo-g, FMo-g, mo-g.

For thermic responses : Mth, FMth, mth.

A separate scoring of these responses should also be used in the graph showing the distribution of determinants. No new bar is necessary for this purpose, as these responses are sub-categories of M, FM or m responses. As in the case of C responses the different sub-categories of C scores are differentiated by dividing the bar into horizontal sections, the movement bars can be divided by a horizontal line. The upper section of the respective movement bar should be designated with the above-mentioned symbols for the auditory, olfactory-gustatory or thermic sub-categories of movement scores.

The consideration and scoring of auditory-olfactory-gustatory and thermic responses refines the assessment of a personality. Further studies and observations by other workers are necessary to explore the meaning of these responses more fully.

I should like to express my thanks to Dr. A. Elliott, County Medical Officer, Kent, for his permission to use the case-material of the Crayford Child Guidance Clinic, Kent.

LEGISLATION AND MENTAL HEALTH IN NORTHERN IRELAND.*

By T. W. H. WEIR, M.D., D.P.H., D.P.M.,

Senior Medical Officer (Mental Health), Ministry of Health, Belfast.

MR. PRESIDENT, Ladies and Gentlemen: as my contribution to this morning's topic, "Legislation and Mental Health," I had hoped to be able to give you the outlines of the proposals contained in a new Mental Health Bill† under way in Northern Ireland. Time has not been on my side, as it just happens the Bill is being presented to-day for its first reading in the Northern Ireland Parliament, and as only after that will it be available for publication, I am not able to make use of it as the basis of my paper this morning.

As an alternative, I propose to give you a brief account of recent legislation already on the statute book in Northern Ireland relating to services concerned with mental health: to present some statistics showing how the existing legislation, the Mental Treatment Act (N.I.) 1932, has functioned since its introduction; and to suggest in the light of experience how this legislation might be improved.

We hear much talk nowadays about a comprehensive health service. It is now accepted that such a service is one of the major requisites to achieve the maximum well-being of the community and thereby its greatest efficiency, something which is very important in these days of struggle for survival.

It is also, at last, accepted that a health service to be comprehensive must make adequate provision for the Mental Health as well as the physical health of those coming within its scope.

Now to bring a comprehensive health service into being, legislation enters the stage; legislation places the responsibility of its provision on specific bodies. Hence your piece of legislation in Great Britain, the National Health Service Act, 1946. This Act, as you know, has as its purpose the establishment of a comprehensive health service designed to secure improvement in the physical and mental health of your country.

In Northern Ireland there has been passed "The Health Services Act (N.I.), 1948" legislation with similar objectives, the establishment of a comprehensive health service, this in Northern Ireland, and following accepted principles includes an appropriate service dealing with Mental Health.

This service aims to secure among other things in Northern Ireland:

- (a) Improvement in the mental health of the people;
- (b) the prevention, diagnosis and treatment of mental illness;

and in addition something which is new to Northern Ireland,

- (c) The ascertainment and prevention of *mental deficiency* and the care, supervision, training and occupation of mental defectives.

* A paper read at the May, 1948, meeting of the Royal Medico-Psychological Association held in Dublin.

† This Bill became law as the Mental Health Act (Northern Ireland) on August 10, 1948, and came into full operation on January 1, 1949.

So, for the first time in Northern Ireland, legislation places the onus on a specific body, that body being the Northern Ireland Hospitals' Authority created by the Health Services Act, to make special provision for mental defectives. No special provision has existed up to the present for mental defectives. Those requiring institutional care are in the workhouses, the mental hospitals and a small number are accommodated in institutions on the outskirts of this City. No legislation similar to the Mental Deficiency Acts of Great Britain exists.

The problem of the mental defective in Northern Ireland has received much consideration during recent years. The matter was examined by the Mental Health Services Sub-Committee of the N.I. Health Advisory Council and a "Report on Mental Deficiency in Northern Ireland," issued in 1946. This report contained recommendations on what measures should be taken in respect of mental defectives, and one was that legislation should be framed to ensure their proper care. This recommendation is about to be implemented.

The new Northern Ireland Health Services Act purposes to accomplish something which has been advocated for many years, that is, the closer integration of the mental health services with the other health services. In Northern Ireland as elsewhere, such mental health services as existed have tended to lead a somewhat isolated existence. Little was thus known by those practising surgery and medicine, of the valuable work done for his patients by the psychiatrist both in and outside the mental hospital. Experience of recent years including the war years has brought very much to the fore the great contribution the mental health practitioner, the psychiatrist, can give to general medicine in the fight against illness.

This isolation of the mental health services has partly been due to the fact that the mental hospital has formed the core of the service; and the manner in which the mental hospital has grown up, from a place originally for the custody of the insane with special legislation applicable to it savouring of prison, still leaves a taint. But the energy of the medical personnel in charge directed towards the cure of their patients has changed such a place from one of custody to one of active treatment. Once, such places (caring for the mentally ill) were wedded to jails, bridewells, but now we see their union with other places of treatment, the general hospitals, the R.M.P.A. acting as best man at the ceremony.

Now this trend towards co-ordination of the mental health service with the other fields of medical service is very laudable, but is attendant with one risk, the risk of submersion, more so as it is a young and not wholly popular service, without the glamour and appeal associated with other sections of medical practice. To guard against such a danger and to ensure that the service has a sufficiently strong voice to put forward its needs in competition with the other interests, it is laid down in the constitution of the Hospitals Authority which resembles your Regional Hospitals Board that at least three of its 33 members shall be persons who have experience in the administration of the mental health services. What is more, the Health Services Act requires that a standing committee with power to co-opt, be appointed for the purpose of the mental health services, to be called the Mental Health Services Committee.

On this committee will rest the responsibility of all matters dealing with mental health including the new mental deficiency measures. The Authority will, of course, see that the policy advocated by the Mental Health Services Committee, fits in with the other services designed to promote the health of the community.

Legislation which has application to mental health can be said to take two forms :

(1) General : Legislation which provides for a complete service, including that dealing with mental health. It is this type of legislation which I have been referring to up to now.

(2) Special : Legislation which provides safeguards where the liberty of the subject may be involved, a circumstance which tends to be peculiar to mental hospitals and similar institutions.

It is to this special legislation that I wish to give particular attention. Such legislation has been framed from time to time to safeguard the liberty of the subject where mental disorder existed or was alleged to exist. In the last century when mental illness was a dread thing, only talked about in whispers, and when the asylum was feared worse than the prison, feared as a place where people could be put away without any redress by unscrupulous persons ; suspicion and terror of wrongful incarceration was rampant, therefore safeguards to prevent such happenings were demanded to mollify such fears and they had to be drastic and all-powerful. Time has marched on and brought changes, altered conditions which are well reflected in the change of names, titles and administrative arrangements which have occurred. You get the names Houses of Industry, madhouse giving place to lunatic asylum, to mental hospital, and now I wonder should it be back to Houses of Industry, because of the development of occupational therapy in the modern hospital? You get the insane, the lunatic, the person of unsound mind and the mentally ill. Again warders, keepers, attendants, and now nurses who look after the patients. Supervision was originally exercised in Ireland by the Inspectors General of Prisons, then by Inspectors of Lunatic Asylums, and now by Inspectors of Mental Hospitals.

These changes have been effected by legislative action from time to time, showing that the law is not static even where it is concerned with the mentally ill.

Nobody objects to safeguards provided they achieve what they set out to do with the minimum of interference. But what are accepted as necessary safeguards in one era may be considered purposeless later, since the circumstances which justified them in the first place may have materially altered. For instance, at one time it was laid down that no person could be deprived of his freedom, even if for the purposes of care and treatment, without the sanction of a judicial authority. Now patients can be held for limited periods for treatment on medical recommendations.

This special legislation with its safeguards applies only to mental hospitals and similar places wherein are received mentally ill persons whose condition is such that for their proper care and treatment the right to detain them against their will is vested in the person in charge. The safeguards include the notifi-

cation of all admissions to these places to a central body which has the right to inspect such places. Not all persons suffering from mental illness require the protection of such safeguards or the places where such safeguards apply. It is not necessary that all mentally ill persons should enter the mental hospital for treatment. Many are aware they need mental treatment, and are quite willing to have it, are quite willing to enter a hospital to obtain treatment, and are quite able to receive it without being subject to special restrictions. Safeguards are not required. Entry and departure from such a hospital should be on the same footing as exists in a general hospital, without any legal formality. Special legislation should not apply to such a hospital.

Let us look for a moment at special legislation which has appeared during the past 20 years, and observe the trend of change. The year 1930 gave the Mental Treatment Act of England and Wales, a piece of legislation which allowed a person to enter a mental hospital for treatment voluntarily, and if not able to enter voluntarily to be received on a temporary basis, provided certain conditions existed; this on the recommendation of two doctors but without the need of a judicial order. Thus for the first time a patient could enter a mental hospital other than having to be certified as of unsound mind. No longer had the person to wait until he was perceptibly insane before he could receive mental hospital treatment, when his chances of recovery were much lessened.

The next piece of legislation appeared in Northern Ireland, the Mental Treatment Act (N.I.), 1932. This Act included the voluntary and temporary procedure as contained in the English Act, with some modifications. One important difference was the use of the criterion "likely to benefit by treatment," in place of the existence of "non-volition," for patients to be received on a temporary basis. This opened the portal of entry under the temporary category much wider.

Other points of difference were that the power of discharge of patients was vested in the medical superintendent. The procedure for entry of certified paying and rate-aided patients was made the same—a petition, one medical certificate and a judicial order. Temporary patients were visited by an inspector of the Ministry within three months of admission.

Then our host country, Eire, produces that courageous piece of legislation, the Mental Treatment Act, 1945, about which Dr. Kearney has just been telling you, whereby the judicial order is abolished altogether.

The trend of change in these various measures has been to enable the entry of patients to mental hospitals at an early stage of their mental illness and to defer the certification of persons as of unsound mind and committal by a judicial authority as long as possible.

Now the swing is back to Northern Ireland, where the text of a new Mental Health Bill covering both mental illness and mental deficiency will soon be made public.

Regarding the existing Mental Treatment Act, Northern Ireland, which has been in operation for the past 16 years, a few remarks on how it has worked.

VOLUNTARY PATIENTS.

To consider first the provision for treatment on a *voluntary* basis. Examination of the numbers of patients who entered the mental hospitals in Northern Ireland for treatment on this basis indicates that there has been an almost consistent rise in the proportion of patients who have become in-patients at their own request.

TABLE I.—*Proportion of Voluntary Admissions to Total.*

Year.	1933.	1934.	1935.	1936.	1937.	1938.	1939.	1940.
Total direct admissions	1,227	1,226	1,281	1,281	1,228	1,295	1,152	1,124
Total direct voluntary admissions	121	117	169	192	182	208	226	221
Percentage of total direct admissions	9.8	9.5	13.2	14.9	14.8	16.1	19.6	19.7

Year.	1941.	1942.	1943.	1944.	1945.	1946.	1947.
Total direct admissions	1,071	914	1,050	1,147	1,097	1,367	1,525
Total direct voluntary admissions	210	231	246	296	299	472	540
Percentage of total direct admissions	19.6	25.3	23.4	25.8	27.3	34.5	35.4

In 1933, the first complete year of the working of the Act, 9.8 per cent. of the total direct admissions were voluntary patients; in 1938, 16.1 per cent.; in 1943, 23.4 per cent., and in 1947, 35.4 per cent. were voluntary patients.

TABLE II.—*Proportion of Voluntary Admissions to Total per Mental Hospital.*

Mental hospital.	1943.	1944.	1945.	1946.	1947.
A	22.9	20.6	23.6	30.4	36.3
B	13.4	21.0	30.9	37.2	47.2
C	1.8	18.5	19.1	30.5	29.3
D	17.4	22.6	21.9	26.9	27.4
E	35.5	43.7	42.3	46.9	44.6
F	21.6	25.4	29.6	33.1	39.5

The rise in proportion of voluntary patients applied in the six mental hospitals, is more apparent in some than others. In one hospital in 1947, 47.2 per cent. of admissions were voluntary, in another 44.6 per cent., the lowest figure being 27.4 per cent.

This increase in the proportion of voluntary patients has been more marked since the opening by the different mental hospitals of out-patient psychiatric clinics at the general hospitals in their areas. The majority of these came into operation during 1946-47 and is reflected in the figures, 27.3 per cent. in 1945, 24.5 per cent. in 1946, and 35.4 per cent. in 1947. These clinics are thus doing useful work in making contact with patients in the early stage of their illness, and the voluntary procedure allows their entry to the hospital on their own application for the necessary treatment.

This rise in the proportion of voluntary patients suggests that the fear of mental hospitals is gradually breaking down and that they are being regarded more and more as treatment centres than as places of detention. The out-

patient clinics are helping in this change of attitude. Patients are, however, beginning to be seen in greater numbers, who, though in need of intern treatment for mental ailments, refuse to go into the mental hospital, as the associations are still too strong for them and they express the fear of the repercussions that a sojourn in the mental hospital may bring to them in the loss of caste in the eyes of their less enlightened fellows.

The question is, must these persons go to the mental hospital? They don't usually show any need for special supervision. They are quite responsible. They are willing to co-operate in treatment. They are willing to go into hospital on the same conditions as apply to ordinary hospitals, and such conditions are suitable to them. I am sure many of you have said to yourselves when faced with such a patient—"If only I had some other place where I could advise him to enter for treatment, I would not ask him to go into the mental hospital, as he does not really need the ordinary mental hospital discipline." Yes, there is need for such accommodation, which, though providing treatment for the mentally ill, does not need to be subject to the special legislative restrictions applicable to mental hospitals.

There is need for this accommodation in addition to that provided by the mental hospital. There would be no more formality of entry to it than to a general hospital, the patient could leave when he liked, there would be no restrictive measures as locked doors. If special precautions are needed for the treatment and care of a patient, then he should be in the mental hospital. The only restrictive measure that such places would require would be subjection to inspection to see that they are being used for the proper type of patient.

The general legislation applicable to the mental health services should enable such places to be provided, with the appropriate regulations as to their management and supervision. If the latter is not provided for, the chances are that they become filled with patients who should be in the mental hospital, both to the disadvantage of the rightful occupants, and to the patient who is not getting the proper supervision. Such accommodation for the milder forms of mental illness is very much needed.

Before leaving consideration of the voluntary procedure, one further point. At present, apart from persons under 16 years of age, medical evidence of need for treatment is not required at the time a person applies for voluntary treatment, though this is the usual procedure for entry to a general hospital. Perhaps at the time of the introduction of the voluntary status it was thought expedient to avoid any apparent obstacles and thus encourage ease of entry. Such a consideration does not seem to be relevant now. It is noticed that the Eire Act requires a medical recommendation, and it seems a desirable thing to bring procedure in line with what applies to ordinary hospitals, namely, that entry to any hospital, including a mental hospital, should be on a medical recommendation.

TEMPORARY PATIENTS.

Now some remarks on how the temporary procedure of admission has worked. This procedure is intended to be used on behalf of persons whose mental illness is of a temporary character and is likely to yield to treatment

within a maximum period of 12 months. The steps required to be taken are, an application made by a relative or other authorized person, with a medical recommendation signed by two medical practitioners, there being no restrictions as to whom the latter may be. No judicial order is required.

The criterion of suitability to be admitted as a temporary patient is "likely to benefit by temporary treatment," and unfit to be received on a voluntary basis.

What advantage has been taken of this procedure of admission to the mental hospital? An analysis of the statistics relating to this class since its introduction, yields several interesting points.

The number of patients in this category entering mental hospitals in Northern Ireland and their proportion to the total admissions has kept much below what was observed in the case of voluntary patients.

TABLE III.—*Proportion of Temporary Admissions to Total.*

Year.	1933.	1934.	1935.	1936.	1937.	1938.	1939.	1940.
Total direct admissions	1,227	1,226	1,281	1,281	1,228	1,295	1,152	1,124
Total temporary direct admissions	63	56	72	93	108	142	126	167
Percentage of total admissions	5.1	4.6	5.6	7.2	8.8	11.0	10.9	14.8
Year.	1941.	1942.	1943.	1944.	1945.	1946.	1947.	
Total direct admissions	1,071	914	1,050	1,147	1,097	1,367	1,525	
Total temporary direct admissions	148	132	161	160	158	265	371	
Percentage of total admissions	13.8	14.4	15.3	13.9	14.4	19.4	24.3	

At the same time there has been a gradual rise in the numbers. During 1933, 5.1 per cent. of the total admissions were temporary patients (9.8 per cent. as voluntary patients), in 1938 it was 11 per cent. rising to 19.4 per cent. in 1946, and 24.3 per cent. in 1947.

TABLE IV.—*Proportion of Temporary Admissions to Total per Mental Hospital.*

Mental hospital.	1943.	1944.	1945.	1946.	1947.
A . . .	4.7	11.0	10.2	12.5	15.3
B . . .	7.2	7.0	6.2	4.1	10.4
C . . .	23.7	19.2	22.5	37.2	40.4
D . . .	21.3	19.2	20.4	17.5	21.7
E . . .	0.7	1.7	0.8	2.8	3.6
F . . .	7.7	8.1	4.6	9.5	8.5

Again, as in the voluntary category, the increases varied from hospital to hospital. In one hospital the proportion was as high as 40.4 per cent. of total admissions as temporary patients in 1947, whilst in another it was as low as 3.6 per cent.

The figures quoted do show that some use has been made of this procedure which allows of temporary treatment in Northern Ireland mental hospitals. But has full advantage been taken of it? To answer this question it was considered that a fair test would be to find out how many patients admitted

as certified patients of unsound mind were able to leave the hospital recovered as a result of treatment within a period less than 12 months from their admission. The grounds for using such data as a test were that if a patient required less than 12 months' treatment to produce recovery, he would have made a very suitable temporary patient.

Figures were collected for the three years 1945-46-47 and they revealed the following :

TABLE V.

	1945.		1946.		1947.
Total certified patients discharged recovered . . .	235	.	206	.	195
Total of above recovered within 12 months of entry . . .	189	.	138	.	141
Percentage of total recoveries recovering within 12 months	80.4	.	67	.	72.2

In 1945, 80.4 per cent. of certified patients discharged as recovered required less than 12 months' treatment in the mental hospitals; similarly, in 1946, 67 per cent. and in 1947 72.2 per cent. of the recovered certified patients had been discharged from the hospitals within a year of admission as persons of unsound mind.

There is only one conclusion that can be drawn from these figures—that many patients for whom the temporary status was designed continued to be sent to the mental hospitals as certified patients unnecessarily. Full use was not being made of the temporary procedure.

Why should this be? Several explanations might be offered.

Ordinarily, the responsibility of making the decision on what basis a mentally ill person shall be sent to the mental hospital for treatment falls on the local general practitioner. He has to decide if it shall be on a voluntary, temporary or certified basis. It is expecting rather much of the local doctor to hope for a correct assessment, as indeed, amongst the more experienced, differences of opinion on such matters are not uncommon. The local doctor should not be asked to make such decisions.

Again, the requirement of a second doctor to complete the medical recommendation for admission of a patient on a temporary basis, in spite of the absence of a bar in the nature of special qualifications for one of the doctors, does not make things any easier. It is not always practicable to obtain the assistance of a second doctor, especially in the more remote districts.

At times the patient's admission on a temporary basis is not so much determined by his mental state and likelihood of recovery, as on the relationship of neighbouring doctors. If the relationship is good the number of temporary patients from that area is good. Similarly, a mentally ill patient coming from a general hospital with at least two housemen on its staff has his chances of being in the temporary category considerably enhanced.

Thus in spite of the widened range of types of patients which the Northern Ireland Mental Treatment Act enables to be dealt with on a temporary basis,

there is a failure to make full use of it. How, therefore, can legislation help in the matter to give the greatest benefit to the patients?

It seems to me the answer is to enable all patients other than those suitable to enter voluntarily, to be submitted for treatment on a temporary basis. And to overcome the practical difficulty of obtaining two medical signatures for the medical recommendation, let one signature suffice, at the same time creating safeguards whereby the patient could have his case considered whilst in the hospital by an independent body, if he so desires.

The period of operation of this procedure should be such time as would allow the patient a reasonable chance to recover with treatment, say one year in the initial stage, followed by two extensions of six months each if needed, giving an overall period of two years, at the end of which time the future prospects of the patient should be pretty clear. A patient could, of course, be discharged at any time during this period, or change to the voluntary status, and where recovery was improbable the person would be discharged or be certified as of unsound mind and detained on a judicial order.

The advantages of this procedure would include the removal of the responsibility from the local doctor of having to decide which patient should be a temporary and which one a certified patient. He would now have the simple working criterion; if the patient is willing to go into the mental hospital for treatment he goes voluntarily; if not, and he needs intern treatment, he goes as a temporary patient.

The onus of classification of the patients would thus shift to the staff of the mental hospital who are experienced in mental illness, and who would have the added advantage of having the patient under observation for sufficient time to enable a considered opinion to be formed on the chances of recovery or otherwise.

At the completion of the two years' temporary treatment it would be necessary to discharge the patient or to regrade him to the voluntary status if in need of further treatment and the patient's wishes to remain, or to certify the patient as of unsound mind and have his further detention authorized by a judicial order.

This suggested procedure would mean that admission to a mental hospital or other place subject to special legislation, would be in two ways:

- (1) On a *voluntary* basis, by application of the person backed by a medical recommendation that treatment is needed;

- (2) On a *temporary* basis, by application of a relative or authorized person supported by the medical recommendation of one doctor.

Such an arrangement would thus defer the use of certification and detention on a judicial order until such times as recovery appears to be unlikely, when further stay in the mental hospital is indicated more on the grounds of need for care than treatment; indeed, detention would then seem to be more a judicial concern than a medical one.

SENILE PATIENTS.

My last remarks concern the senile, the old and mentally infirm persons. On this subject the mental health service and the recently created or rather

categorized branch of medicine, geriatrics, have contact. What should be done for the old person who through decay of his faculties is no longer able to look after himself and his affairs, and where his loss of control may render him difficult to manage.

There is no doubt the allotted span of life is lengthening and may bring with it an increase of persons with mental infirmity. Modern social conditions with the trend to smaller houses and scarcity of domestic help makes the care of these old persons by their relatives at home very difficult. Some are being placed in nursing homes where there is absence of supervision to ensure their proper care. Others, with the greatest reluctance of their friends have to be committed to the mental hospital.

The admission of these old people into the mental hospital is apt to hamper the work there, as it means the diversion of staff to care for them—staff which could be more advantageously employed in the nursing of the recoverable patients, especially in these days of acute staff shortage.

TABLE VI.—*Age Groups and Dementia.*

Age on admission.	1943.	1944.	1945.	1946.	1947.	Average
65-74 incl. . .	139	143	158	162	208	..
75-84 . . .	79	74	100	91	99	..
85 upwards . .	5	11	14	15	14	..
75 . . .	84 (7.1%)	85 (6.9%)	114 (9.8%)	106 (7.3%)	113 (6.7%)	7.5%
65 . . .	223 (19%)	248 (18.6%)	272 (23.3%)	268 (18.4%)	321 (19.0%)	21.5%
Dementia . .	146 (12.5%)	149 (12.1%)	170 (14.6%)	174 (11.9%)	233 (13.8%)	13.1%

Examination of the ages of patients on admission during the five year period, 1943-47, shows that persons 65 years and upwards formed 21.5 per cent. of total admissions, varying from 18.4 per cent. in 1946 to 23.3 per cent. in 1945, whilst in the same period those of 75 years and over were 7.5 per cent. of total admissions. The great majority of these patients would be suffering from permanent mental infirmity due to age or organic disease where recovery was impossible and where nursing care rather than active psychiatric treatment was the requirement.

As a matter of interest the number of patients diagnosed as suffering from dementia on admission during the same five year period was obtained (Table VI) and it was found that this class of patient made up 13.1 per cent. of the total admissions (14.6 per cent. in 1945), suggesting that quite a high proportion of the entrants to the mental hospitals were not likely to get better, were hopeless cases from the treatment point of view. The great majority of these states of dementia were most likely due to mental infirmity of age or arteriosclerosis.

This relatively high incidence of people having to enter the mental hospitals through mental infirmity raises two points :

(1) Should the mental hospital of the future, which is tending more and more to become an active treatment centre, be obliged to receive these old persons? Would it not be better to arrange for their housing in buildings designed for their needs, of the single-storied type, say, apart from the mental

hospital? As things are at present, the old people in the average mental hospital have to live in buildings which are unsuited to them, perhaps live on the first floor with little or no opportunity of spending part of the time in the open air. Again the more feeble, bedridden type encroach on beds in the acute sick wards.

Any special scheme of accommodation for old people would come within the responsibility of the mental health services, and would be staffed by persons with some training in mental nursing and be supervised by the mental hospital medical personnel.

(2) The other point is the question of procedure for committal of these mentally infirm persons.

The relatives of many of these persons strongly object to the suggestion that the old person is of unsound mind, and resist the step of certification as a means of having them sent to the mental hospital. On sentimental grounds there appears to me to be some justification to try to get round this objection if possible.

Looking at what is sanctioned in first childhood by the special legislation of recent years, the submission of a person under 16 years by a parent or guardian for voluntary treatment, why not a somewhat similar arrangement in second childhood? You will all agree that mentally infirm persons should have a guardian appointed to look after their interests, whether they be inside or outside an institution. Why should legislation not provide that the official guardian could submit their charge to the care of a mental hospital or other place, perhaps specially provided for the care of the mentally infirm, on a voluntary or perhaps better term, agreement arrangement? The interests and welfare of these old people would be safeguarded by their being included with those having the protection of special legislation, yet they would be spared the formal committal by judicial order as persons of unsound mind, a procedure which still has sinister associations.

CONCLUSIONS.

In conclusion let me summarize the points covered.

Legislation is playing an important role in the effort to provide a comprehensive health service, and in this comprehensive health service, the service dealing with mental health will be called to play an ever increasing and important part.

Special legislation has necessarily to be provided where the liberty of the subject is involved, to ensure requisite safeguards, and this applies to mental hospitals and allied places where treatment and care may require the right to detain.

This special legislation endeavours to keep in step with modern thought and practice.

From experience of the working of the Northern Ireland Mental Treatment Act, 1932, the conclusion is come to that admission to mental hospitals should be limited to two procedures, voluntarily or on a temporary basis.

It is suggested that temporary treatment should cover at most a period of two years, and only at the end of that time if further detention is needed, or if recovery is deemed to be improbable beforehand, should certification as being of unsound mind and detention on a judicial order be resorted to.

Lastly, it is suggested that persons who are mentally infirm through age should be provided for in special accommodation apart from the mental hospital and that their admission to such places should be on the application of a guardian.

THE INCIDENCE OF MONGOLISM IN THE GENERAL POPULATION.

By L. S. PENROSE, M.D.,

Galton Professor of Eugenics, University of London.

[Received May 18, 1949.]

THE generalized foetal dysplasia known as mongolism is one of the most frequent causes of severe mental defect. It accounts for something like 5 per cent. of all institutional cases in this country (Tredgold, 1929). The incidence of the condition in the general population is difficult to estimate with accuracy because of the high mortality it carries, but an exact knowledge of the frequency would be useful both for biological and for administrative reasons.

At birth, the incidence can be estimated from maternity hospital records and Jenkins (1933) reported six cases among 3,818 births in a Chicago hospital, equivalent to an incidence of one in 636. Malpas (1937) found 18 cases among 13,964 births at the Liverpool Maternity Hospital, or one in 776. These figures agree fairly well with one another and may probably be taken as reasonable estimates of the frequency at birth in European populations. Another method is to investigate a series of families, checking, as far as possible, histories of abnormalities present at birth with records from practitioners or hospitals. A series of 1,217 defectives, none of whom was a case of mongolism, was found to have 4,374 sibs and seven of these were mongolian imbeciles (Penrose, 1938). The proportion (1 in 629) is of the same order of magnitude as that found in all births.

The ascertainment of cases in the age interval from birth up to five years has hitherto not been satisfactorily carried out. Once the infant has left an obstetric hospital, the diagnosis of mongolism is made with reluctance by visiting physicians and complete ascertainment is difficult. However, during the school age period, the defect cannot be permanently hidden. Figures for the incidence in the age interval from 5 to 14 years were kindly provided for me, some years ago, by Dr. E. O. Lewis (1929) from unpublished material. In a population of 426,715 children between these ages, 103 cases of mongolism had been found. This is equivalent to an incidence of rather less than one in 4,000. The more recent figures, given in Table I, show 53 cases in a school age population of 144,000, or an incidence of about one in 3,000. The importance of the condition can be judged from the fact that mongoloids form at least a tenth of all imbeciles and idiots in this age group, the incidence of all imbeciles and idiots being estimated at about one in 400.

It is possible to estimate the frequency of mongolism at ages after 14 years from the records of Local Authorities. The numbers of cases notified in five

TABLE I.—*Ascertained Cases of Mongolism in Five Districts.*

Age group.	District.					All districts.	Total population* (thousands).	Percentage incidence of mongolism.
	2.	3.	4.	5.				
0-4 .	1	0	0	3	2	6	80	0.007
5-9 .	5	2	4	4	8	23	75	0.031
10-14 .	4	7	2	12	7	32	69	0.046
15-19 .	3	2	5	9	2	21	70	0.030
20-24 .	3	4	1	9	6	23	73	0.031
25-34 .	3	1	7	10	3	24	136	0.018
35-44 .	2	0	4	2	1	9	106	0.008
45 and over .	0	0	0	0	0	0	164	0.000
All ages .	21	16	23	49	29	138	773	0.018
Thousands in population .	124	111	106	182	250	773	..	..
Percentage incidence of mongolism .	0.017	0.014	0.022	0.027	0.013	0.018	..	..

* The partitioning of the total population in the different age groups is based upon pre-war estimates.

suburban areas south and east of London are shown in Table I. The incidence at all ages varies considerably in different districts and the total ascertainment of 138, 67 males and 71 females, in a 773,000 population, or nearly one in 6,000, is undoubtedly an underestimate. The ascertainment below the age of ten years is clearly incomplete because fewer cases were notified in the quinquennial age groups before 10 than in the age group 10 to 14. Since the incidence of mongolism at birth can be assumed to be of the order of 1 in 700, or 0.143 per cent., a great fall in numbers must take place between birth and the tenth year of age. Existing statistics do not tell us where this loss takes place, but it probably is more rapid during the first year, and especially in the first month, than later on. Fig. 1 shows a comparison of ascertained incidence with supposed true values including these early years and Table II also gives the approximate actual numbers in a population of one million. The total incidence in the community at all ages, taking into account the unrecognized cases younger than 10 years, should be almost one in 3,000. This estimate is much higher than that given by Doxiades and Portius (1938), i.e. one in 7,000, for the general population in Germany, but their ascertainment is not likely to have been complete.

The supposed figures given in Table II can also be used to estimate the approximate expectation of life of mongoloid infants; this would be about 12 years at birth. A previous estimate, which I made on the basis of Lewis's figures obtained in 1929, was eight to nine years, and it may well be that,

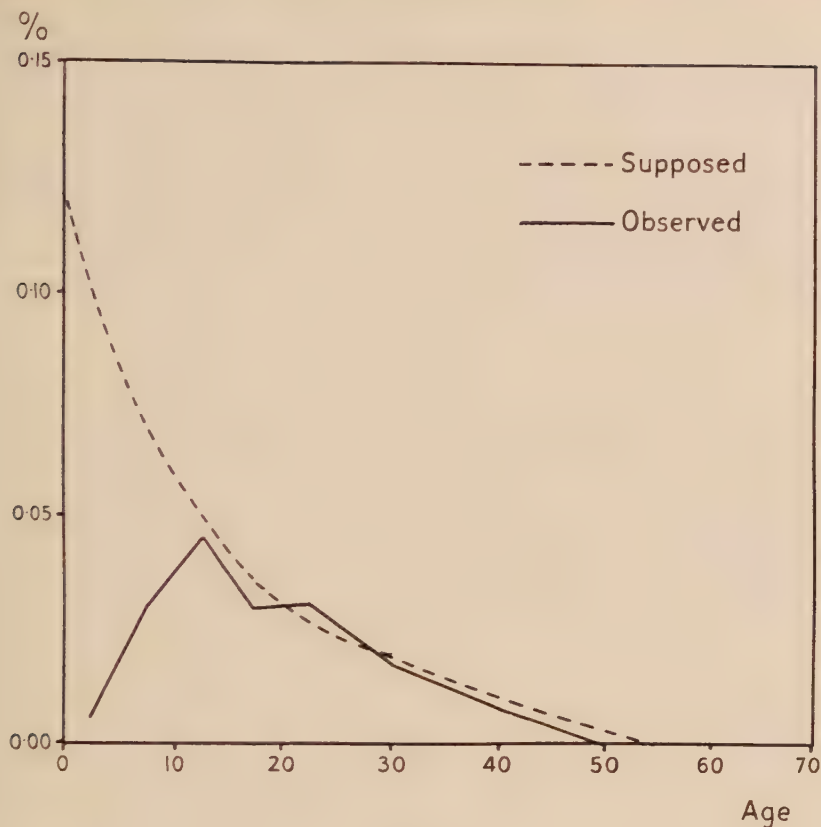


FIG. 1.

during the last 20 years, there has been a substantial gain in life expectation for mongols as a result of improved medical care.

TABLE II.—*Incidence of Mongolism at Different Ages.*

Age.	Recorded percentage incidence.	Supposed percentage incidence.	Supposed actual numbers in one million population.	
			Total persons.	Mongoloids.
At birth	0.143	0.143	..	..
0-4 years	0.007	0.100	104,000	104
5-9 "	0.031	0.070	97,000	68
10-14 "	0.046	0.050	89,000	44
15-19 "	0.030	0.035	90,000	32
20-24 "	0.031	0.027	94,000	25
25-34 "	0.018	0.020	176,000	35
35-44 "	0.008	0.010	138,000	14
45 years and over	0.000	0.001	212,000	2
All ages	0.018	0.032	1,000,000	324

In this note I have neglected the question of sex differences. Some writers have stressed the apparent excess of male mongoloids, but this inequality seems only to apply to institutional cases. There may, however, be significant differences in mortality rates between the sexes (Penrose, 1932).

From many points of view an accurate ascertainment of cases of mongolism in the community is desirable, and under the most recent health legislation it should be possible to obtain accurate figures in the space of a few years. The present communication merely gives a rough outline of the problem, the details of which subsequent work could complete.

REFERENCES.

- DOXIADES, L., and PORTIUS, W.—(1938), "Zur Ätiologie des Mongolismus unter besonderer Berücksichtigung der Sippenbefunde." *Z. Konst.-Lehre*, **21**, 384.
 JENKINS, R. L. (1933), "Etiology of Mongolism," *Am. J. Dis. Child.*, **45**, 506.
 LEWIS, E. O. (1929), Personal communication.
 MALPAS, P. (1937), "The Incidence of Human Malformations," *J. Obst. Gynaecol.*, **44**, 434.
 PENROSE, L. S. (1932), "On the Interaction of Heredity and Environment in the Study of Human Genetics," *J. Genetics*, **25**, 407.
Idem (1938), A Clinical and Genetic Study of 1,280 Cases of Mental Defect," *Sp. Rep. Ser. Med. Res. Counc.*, No. 229, H.M.S.O.
 TREDGOLD, A. F. (1929), *A Textbook of Mental Deficiency*. Baillière, Tindall & Cox, London.
-

THE DIFFERENTIAL LEUCOCYTE COUNT IN MONGOLS.

By ALEXANDER SHAPIRO, M.B., B.S., D.P.M.,

Deputy Medical Superintendent at Middlesex Colony.

[Received 27 February, 1949.]

TURPIN AND BERNYER (1947), working on the influence of heredity on the Arneth count (Cooke and Ponder's (1927) modification), found that in mongols it was shifted to the left, i.e., that their polymorphonuclears had fewer lobes and were therefore more immature.

These results were very interesting, and it was decided to repeat the experiment and at the same time investigate the differential counts in these patients.

Method.—Blood smears were taken from a group of ten mongols and ten control mentally defective cases, all adult females. The presence of infection was excluded clinically in both groups.

As the lobulation is frequently irregular, particularly in the young polymorphs, it is often difficult to decide whether the filament of chromatin joining the lobes is thin enough for the nuclear material to be considered as completely divided. This ultimately depends on personal judgment, and it was therefore decided that a control group should be examined at the same time. To diminish the personal factor still further the counts were done "blind," and it was not known to which group the smears belonged until the differential counts had been computed.

In order to keep all the factors as constant as possible the control group was matched for age with the mongols, but otherwise was a random sample of mentally defective patients at the Colony. Their figures are given in the table. All the smears were taken just before lunch at 11.45, some five hours after breakfast, to keep the alimentary leucocytosis in the same phase.

McGregor, Richards and Loh (1940) have shown that differential counts vary according to the area of the smear examined. To allow for this error a standard method of carrying out the count was adopted. This consisted in counting horizontally across a $\frac{7}{8}$ -in. square coverslip along both edges of the smear, and working horizontally inwards towards the centre.

It was found that although the type of cells found did vary with the area of the smear, small lymphocytes being much more numerous towards the centre, there appeared to be no definite variation in the maturity of the polymorphonuclear cells in the different parts of the smear.

Approximately 500 cells were counted on each smear to increase the validity of individual counts. This gave the number of polymorphonuclear cells counted as about 250, their exact number depending of course on the percentage of polymorphonuclears in the total count. This is well in excess of the standard method devised by Cooke and used by Turpin and Bernyer, when only 100

polymorphonuclear cells are counted. Turpin and Bernyer used an index of shift to record their results. This was obtained by neglecting the number of cells with three lobes, and by multiplying two lobed cells by -1 , and one lobed cells by -2 and by multiplying the four and five lobed cells by 1 and 2 respectively. The average lobulation may be calculated from the index by

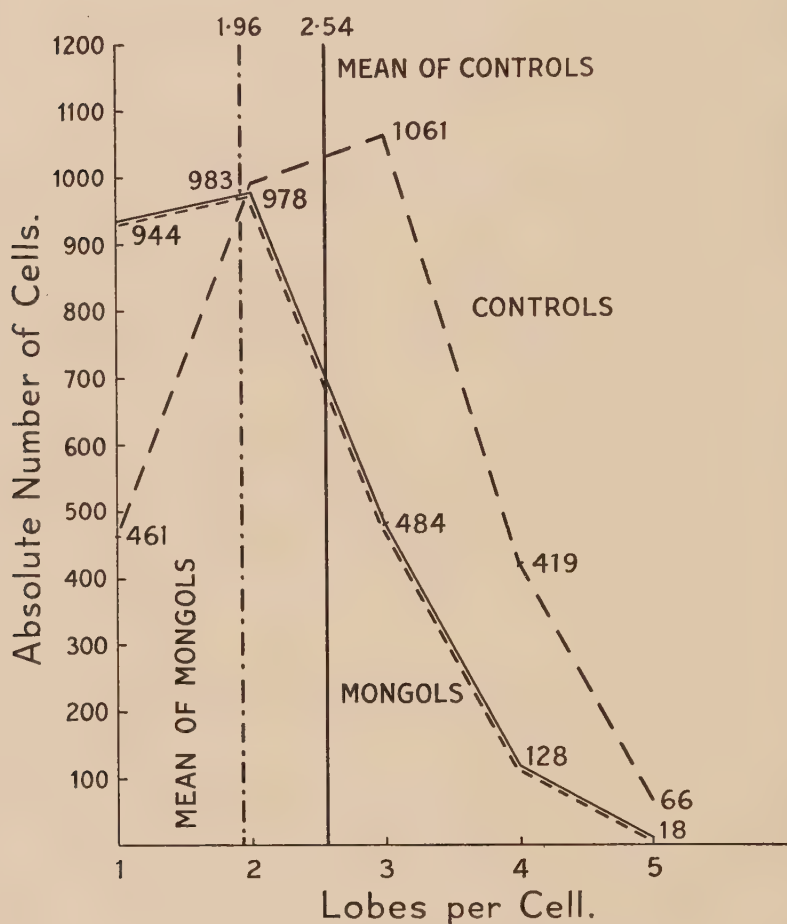


FIG. 1.—Showing the total numbers of the differently lobed polymorphonuclears in the mongol and control groups. All counts have been adjusted to 500 leucocytes. Figures on the graph give the exact values.

dividing the index by 100 and subtracting the result from 3. It was considered that working with the average lobulation was a simpler and a more direct method, which moreover did not assume the mean to be artificially located at three lobes, and the index was therefore not used.

The appended table gives details of all the counts. The figures show that the average number of lobes per polymorphonuclear cell was 1.93 ± 0.2339 for the mongols and 2.54 ± 0.1613 for the controls.

Table Comparing the Means of the Two Groups and their Statistical Significance.

Cells.	MONGOLS.		CONTROLS.		t.	p.
	Mean.	σ .	Mean.	σ .		
Polymorphs . .	51.2	8.9	59.2	6.8	2.25	.02-.05
„ lobe count . .	1.96	0.23	2.54	0.16	6.45	<10 ⁻⁸
Lymphocytes . .	35.9	8.5	29.3	7.3	1.75	—
Eosinophils . .	2	3.1	1.7	1.8	—	—
Basophils . .	1.6	2.4	0.6	0.4	—	—
Monocytes . .	9.3	3.2	8.8	4.1	0.3	>0.1

The difference between the means is significant, the value of "t," the critical ratio, being 6.45. This means that the probability of the difference being due to chance is very much less than 10⁻⁸.

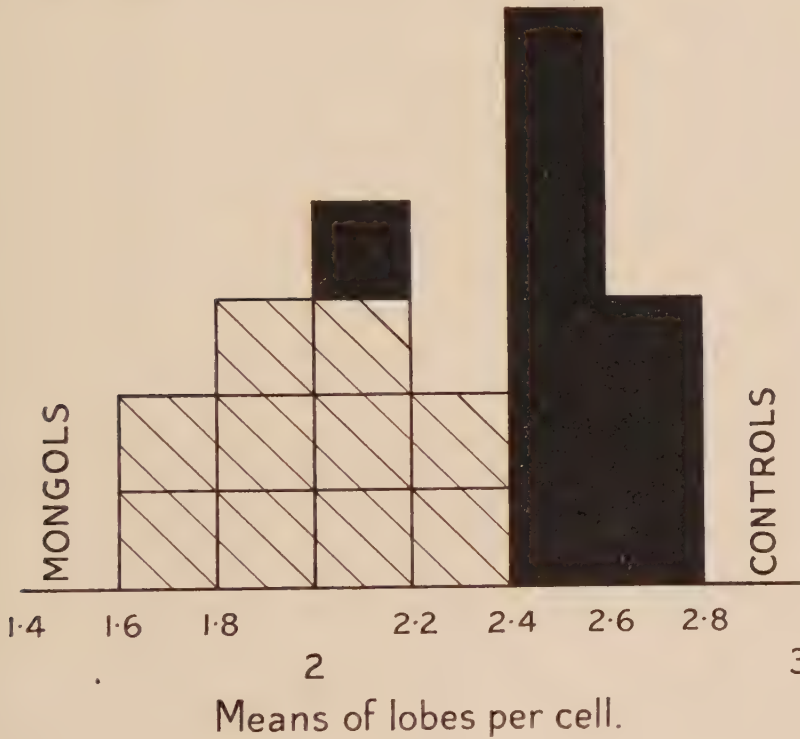


FIG. 2.—Histogram showing the distribution of mean lobulation of polymorphonuclear cells.

The results of the rest of the differential count are much less significant than the polymorphonuclear count. The slight lowering of the polymorphonuclear percentage has a critical ratio ("t") of 2.25, that is, a probability of less than .05 but greater than 0.02 of the two samples being drawn from the same universe.

The lymphocyte counts do not differ significantly, and there is too much

variation in the counts of the eosinophils, basophils and monocytes for any conclusion to be drawn from them. The apparently greater variability in the percentage of most of the cells of the mongolians is not statistically significant.

DISCUSSION.

As far as could be ascertained there are no reports in the literature on the polynuclear count of mongols except the one by Turpin and Bernyer already quoted.

The reasons for the marked shift to the left are unknown. The counts have been shown to be constant in individuals and subject to hereditary influences (Turpin, Piton and Caratzali, 1939 and 1941). They are known also to vary with the climate, shifts to the left having been observed in Europeans and indigenous inhabitants in Iraq, Egypt, Malaya and China. As the shift to the left usually disappears on return to temperate climate (Whitby and Britton, 1946), it is probable that its causation is a metabolic one. Speculation without further knowledge of the mechanisms involved would be, it is felt, rather profitless, and the finding is presented merely as a contribution to the general clinical picture of mongolism. This finding may be of use in investigating the heredity of mongolism, should this characteristic prove to be due to parallel causes produced by the same genetic make-up, and not a consequence of the final physical configuration. It is hoped to make this problem the subject of a further communication.

Two further points merit mention. It will be noted that all the controls form a distinct group, which does not overlap the mongol group except for the one case of athetosis among the controls.

The shift to the left in this case proved to be fairly constant on retesting, and she was free from any infection. The results merit a further study of these cases.

Secondly, one of the mongols has over 10 per cent. of eosinophils. This eosinophilia has been reported before by Manitz (1932), who found 17 per cent. of his 27 cases to have eosinophilia, and there was a count of 21 per cent. and 13 per cent. among the cases. The reason for this phenomenon is also obscure.

I have much pleasure in gratefully acknowledging the help given by Prof. L. S. Penrose and Mr. C. A. Stickland in the preparation of this paper, and by Dr. H. Fleischhacker in checking the consistency of my counts.

My thanks are due to Dr. E. D. Taylor for permission to use the clinical material of the Colony.

REFERENCES.

- COOKE, W. E., and PONDER, E. (1927), *The Polynuclear Count* (London).
 MACGREGOR, R. G. S., RICHARDS, W., and LOH, G. L. (1940), *J. Path. Bact.*, **51**, 337.
 MANITZ, H. (1932), "Das humorale Syndrom der Mongoloiden," *Deut. Ztschft. f. Nervenhe.*, **126**, 80.
 TURPIN, R., and BERNYER (1947), "De l'influence de l'hérédité sur la formule d'Arneth," *Rev. d'Hématol.*, **2**, 189.
 TURPIN, R., PITON, J., and CARATZALI, A. (1939), "Recherches sur les corrélations leucocytaires des jumeaux," *Proc. Seventh Internat. Genet. Congress, Edinburgh*.
Idem (1941), "L'influence de l'hérédité sur les leucocytes sanguins," *Biologie médicale*, **31**, Nos. 3-4.
 WHITBY, L. E. H., and BRITTON, C. J. C. (1946), *Disorders of the Blood*. London: J. & A. Churchill.

ADDICTION UNDER THE MENTAL TREATMENT ACT, EIRE, 1945.*

By H. J. EUSTACE, M.B., D.P.M.,
Medical Officer, Hampstead, Glasnevin, Dublin.

MANY writers on the subject of the treatment of addictions have suggested that for treatment to be efficacious, a period of detention legally enforced is necessary, and it is perhaps strange that a country which tends to regard personal failings and idiosyncrasies with a kindly eye has been probably the first to provide a method of enforcing it without recourse to a legal sentence.

When the Irish Division was asked to suggest amendments to the Mental Treatment Act of 1945, one of its suggestions was that there should be incorporated some method for the detention and treatment of addicts and also of sexual perverts. These were cunningly combined in the Act as addicts, and a clause inserted whereby they could be treated as temporary patients for a period of six months.

In Eire a temporary patient is one who is suffering from mental illness and who is unfit to be a voluntary patient, and requires for his recovery not more than six months' suitable treatment. We are not complicated by the patient's ability to express volition, but it means that a patient entering a mental hospital is very rarely certified as a person of unsound mind in the first place. This definition of a temporary patient allowed a subdivision to be inserted dealing with the individuals who were not said to be suffering from mental illness, but merely classified as addicts, and believed to require for their recovery at least six months' preventive and curative treatment.

The definition of an addict caused considerable difficulty. Our politicians are irrevocably wedded to the Oxford Dictionary, generally with considerable success, but this time it was of no assistance, and for the purpose of the Act an "addict" was defined as a person who (a) by reason of his addiction to drugs or intoxicants is either dangerous to himself or others, or incapable of managing himself or his affairs, or of ordinary proper conduct, or (b) by reason of his addiction to drugs, intoxicants or perverted conduct is in serious danger of mental disorder.

It therefore means that at the request of a relative, backed up by the recommendation of one or two medical practitioners and an order by the Medical Superintendent of the receiving mental hospital, an individual can be detained for a period of six months in an authorized institution.

There are some points to comment on in the definition of an addict which cause the recommending doctors trouble: (1) Is he an addict in the dictionary

* A paper read at the Spring Meeting of the Royal Medico-Psychological Association held at Dublin, 12-13 May, 1948.

sense? The confabulation of the patient is at times exceeded by the confabulation of the relatives. The consultant probably has no evidence of addiction in the sense of repeated lapses from grace, and has to rely on hearsay evidence and the present circumstances to act as a guide. Personally I feel that the evidence of the family should not be unsupported. (2) Ordinary proper conduct is in itself difficult to establish. What is the criterion? "Autres temps, autres mœurs." There is the household where both partners drink to excess—as recently I was met by a wife who had two black eyes, and who had retaliated with the proverbial rolling-pin on the husband's skull, with a request to remove the husband as dangerous. On inquiry it appeared that the cause of the dispute was the ownership of the last half-glass in the bottom of the bottle. (3) "Serious danger of mental disorder" can only be a matter of opinion, obvious in serious cases, but more apparent to relatives than physicians in others.

On the whole, from the medical point of view the definition has worked well in that it allows the removal of a patient who is unwilling or incapable of being a voluntary patient, and yet has not reached the stage of being identified as suffering from mental illness, and these definitions have proved to be stumbling-blocks to the litigiously-minded, and a safeguard to the detaining hospitals.

We have now had some 15 months' experience of the Act, and during that time 141 persons have been detained as temporary patients and addicts. Eight of them were drug addicts, and 133 alcohol addicts. Apparently no person was detained under this section as a case of perverted conduct. Nearly two-thirds of these persons were detained in private institutions as distinct from district mental hospitals. 75 of these 141 persons have been discharged after treatment, 41 as recovered, but 12 were known to have relapsed in a short time; 28 as improved, 5 as not improved, and 1 died. This suggests that there was some improvement in 57.

A survey in five or ten years' time will be more valuable, but so far there are some factors which have become evident. It is obviously a useful and helpful measure in cases where personality changes have not taken place, but too often the recommendation for treatment has come too late, and the patient, having recovered from his acute alcoholism, is resentful of his detention, unco-operative, a disturbing and disgruntled member of the hospital community, and two such individuals in a ward will make life very unpleasant for the staff as well as upsetting to others.

Treatment of the underlying psychopathic state is difficult, and in fact the six months tend to be a breathing space for harassed relatives to reconstitute home and finances, the hospital meanwhile taking the harassing. Whether repeated implementation of the Act in individual cases will have a more beneficial result remains to be seen. To my mind the most helpful aid to rehabilitation has been the active co-operation of Alcoholics Anonymous, and we are fortunate in Dublin in having an extremely energetic and active branch whose group therapy has been very successful even in paranoid cases. If the patient co-operates in treatment it is generally possible to discharge him before the six months' period is completed, though the Act suggests he

should be detained for the full time, but in many cases it is helpful to the co-operative patient to feel he is on a voluntary footing. I would like to have been able to compare the figures of voluntary patients seeking treatment for addictions with these legally detained persons, but the figures were not available. In my own experience they very largely exceed the temporary patients and are usually more satisfactory to treat.

We have not yet had an opportunity of testing this section of the Act in the law courts, but legal opinion from the highest sources assures me that the section is unconstitutional and dangerous. It would appear that it permits of possible abuse where the relatives can so mislead the recommending doctors that injustice is done to the patient, so that an unwanted or inconvenient relative is removed while perhaps some financial or property readjustment is made in his absence. There do not appear to be adequate safeguards in the Act which can be immediately called on to protect the individual. It is difficult if not impossible for a medical superintendent to investigate the full history of the case before admission, and when the patient has recovered from his acute stage and finds himself in a mental hospital, it takes some time for such safeguards as the Act provides to be called into play. These safeguards are that the patient may write to the Minister demanding an enquiry, or any person may apply to the Minister for an order for the examination by two registered medical practitioners approved by the Minister to examine the patient. To the legal mind it is unsatisfactory that an addict, no matter at what stage, should be deprived of his liberty without very full enquiry, and they do not think that enquiry should be solely medical. While the medical attitude is that the doctor is trying to rehabilitate the patient in a quiet manner, the legal view is bound up with the old dread of the stigma of having one's liberty curtailed—this time not by the law, but by the physician.

A further difficulty lies in the fact that for most of the time the patient is under treatment his mental capabilities are normal and he must be regarded as a sane man, and this is more obvious and much quicker than a man recovering from a psychotic episode, but the treatment is more protracted. We meet here the case of the business man capable—at any rate to the lay mind—of carrying on his business, but prevented from doing so by medical treatment.

You may feel that these objections hold in any certified case, or temporary patient, but with them there is or has been more obvious and usually longer mental derangement, and the reasons for hospitalization are more urgent.

Solution of the legal difficulties might be found in defining addicts as persons of unsound mind, as in fact usually they are at some stage of their illness, in which case they could be regarded as ordinary temporary patients. It has been suggested that before anyone is labelled as an addict, full inquiry should be made before the district justice *in camera*. This would appear to be unnecessarily cumbersome and often time-expending, and it would obstruct what the whole Act has successfully achieved—the recognition of mental illness as a medical fact and suitable for medical rather than legal treatment. Nevertheless as the Act stands at present it is imprudent for the recommending doctors to label an individual as an addict unless they have very good evidence to go on, and it is certainly insufficient to have unsupported evidence.

RE-TESTING OF THE INTELLIGENCE QUOTIENT AND THE SOCIAL AGE.

By G. DE M. RUDOLF, M.R.C.P., D.P.H., D.P.M.,

Visiting Psychiatrist, Hortham Colony, Bristol.

[Received 23 March, 1949.]

RE-TESTING of the same individuals is a measure of the reliability of a test, a high correlation indicating that the results are consistent. Wechsler found the correlation for his test was $.94 \pm .013$ for 32 children aged 10-13 years re-tested from one month to one year later, and $.94 \pm .018$ for 20 adults aged 20-34 years re-tested after the same intervals of time. These figures indicate that the test itself is reliable.

In the present investigation the Verbal form of the Wechsler-Bellevue test has been given on more than one occasion to 262 defectives of both sexes, the re-tests being performed from 6 to 18 months after the previous test. Doll's Social Maturity Test has been used for determining the Social Age. At the Colony, at which the investigation was carried out, a series of defectives was being actively treated for mental deficiency by means of an oral preparation. This series has been omitted when appropriate from these comparisons.

RE-TEST OF I.Q.

Table I shows the variations found on re-test of the same subjects, pairs of results being compared.

TABLE I.—*Variations in I.Qs. on one Re-test of Same Subjects Six Months or More after Previous Tests. (Percentages in brackets.)*

	Higher.	Stationary.	Lower.	Totals.
Male . . .	114	63	78	255
Female . . .	74	20	46	140
Totals . . .	188 (47.8)	83 (21.0)	124 (31.4)	395

The number of re-tests on two occasions was 138 (see Table II). Tables I and II show that more cases showed rises of I.Q. on re-test than falls or stationary states. If all re-tests showing a rise in Table II are combined, a total of 110 (79.8%) is obtained, whereas all re-tests showing a fall number only 78 (56.6%), and those showing adjacent tests without change number 47 (34.1%).

The rise of I.Q. is the reverse of that found when children are re-tested by means of tests of the Binet-Simon type. With this type the I.Q. falls, as the

TABLE II.—*Showing Higher, Higher and Lower (H + L), Higher and Stationary (H + S), Stationary, Stationary and Lower (S + L), and Lower I.Qs. on Two Re-tests. Mixed results (e.g. S + L) are not given in correct order.*

	Higher.	H + L.	H + S.	Stationary.	S + L.	Lower.
Male .	16	45	28	7	7	5
Female .	7	13	1	1	3	5
	—	—	—	—	—	—
Totals .	23	58	29	8	10	10

mental age increases less rapidly than the chronological age, this difference being particularly marked in mental defectives (Wechsler). Kuhlman, who re-tested 639 feeble-minded cases over 10 years, found that the I.Qs. decreased systematically with age, being most marked in cases with I.Qs. of 40 or more.

RE-TEST OF SOCIAL AGE.

Variations in behaviour as recorded by Social Age are of interest (see Tables III and IV).

TABLE III.—*Variations in S.A. on one Re-test of Same Subjects, Six Months or More after the Previous Test.*

Higher.	Stationary.	Lower.	Total.
204 (44·8)	95 (20·8)	157 (34·4)	456

TABLE IV.—*Variations in S.A. on Re-test on Two Occasions of Same Subjects, Six or More Months after Previous Test. Mixed results not shown in correct order.*

	Higher.	H + L.	H + S.	Stationary.	S + L.	Lower.
Male .	28	65	35	4	15	7
Female .	2	13	8	2	10	3
	—	—	—	—	—	—
Totals .	30	78	43	6	25	10

A comparison of Tables I and III shows that the proportions of all variations on one re-test of the Wechsler and the S.A. are very similar and can be regarded as identical. When Table IV is treated in the same manner as Table II, a total of 151 (78·7%) rises of S.A. is obtained. The re-tests showing a fall number 113 (58·9%), and those showing adjacent tests without change number 74 (38·5%). These comparisons of S.A. and I.Q. show that the proportion of changes on re-test are practically identical, and suggest that the I.Q. and the S.A. vary with each other in the same subjects. This is, however, not the case. From Tables V and VI, it can be seen that, for instance, with 147 rises of I.Q. only 46·2% of S.As. on the same subjects showed a rise. Similarly, on 22 subjects re-tested twice, for two consecutive rises of I.Q. these individuals showed only 9 (40·8%) rises of S.A. Therefore, behaviour does not necessarily

vary with variations of I.Q. in the same subject, although in a series there is a strong tendency for behaviour to improve with rise of I.Q.

TABLE V.—*Variations on Re-testing on Same Subjects.*

Variations in I.Q.	Totals.	S.A.		
		Rise.	Stationary.	Fall.
Rise . . .	147 .	69 (46.2)	26 (17.7)	52 (35.38)
Stationary . .	55 .	17 (30.9)	17 (30.9)	21 (38.2)
Fall . . .	111 .	46 (41.4)	24 (21.6)	41 (36.9)

TABLE VI.—*Variations on Re-testing the Same Subjects Twice. Steady = Same Type of Change on Two Adjacent Testings.*

Variations in I.Q.	Totals.	S.A.			
		Rise.	Stationary.	Fall.	Variable.
Steady rise . . .	22 .	9 (40.8)	2 (9.11)	6 (27.3)	5 (22.7)
Steady stationary .	4 .	1 (25.0)	1 (25.0)	1 (25.0)	1 (25.0)
Steady fall . . .	13 .	6 (46.2)	0 (0)	5 (38.5)	2 (15.4)

CHRONOLOGICAL AGE.

The rises of I.Q. shown on one re-test might occur during development, and be present in the defectives of a younger age only (see Table VII).

TABLE VII.—*Variations of I.Q. on Re-test arranged according to Ages of Testees (Male and Female).*

Chr. age-groups in years.	Total tests compared.	Rise.	Stationary.	Fall.
10- . . .	96 .	50 (52.0)	12 (12.5)	34 (35.4)
20- . . .	163 .	76 (46.6)	39 (23.9)	48 (29.4)
30- . . .	83 .	41 (49.5)	13 (15.7)	29 (35.0)
40- . . .	27 .	17 (63.0)	10 (38.0)	0
50- . . .	11 .	7 (63.6)	4 (36.4)	0

The table shows that the proportion of rises did not decrease with chronological age, nor did the proportion of falls increase with this age.

EPILEPSY.

Amongst the series of cases, 25 epileptics were included. A total of 84 tests were performed on these cases (Table VIII). This table shows that the epileptics, all of whom were receiving medicinal treatment, if required, for their epilepsy, did not show a lower proportion of rises of I.Q. or S.As. and a higher proportion of falls of I.Q. or S.A. than did the cases of the whole series.

TABLE VIII.—*Variations in I.Q. and S.A. on one Re-test on 25 Epileptics.*

	Higher.	Stationary.	Lower.	Totals.
I.Q. . . .	22 (53.6)	5 (12.4)	14 (34.2)	41
S.A. . . .	17 (39.6)	9 (20.9)	17 (39.6)	43

The absence of deterioration in these epileptics is in accordance with the findings of Barnes and Fetterman, who found, on the whole, no Binet I.Q. deterioration in 35 epileptics over 10 years. On the other hand, Rubisoff found that 66 epileptics showed an average drop of four points of I.Q. Binet in from 1 to 11 years, and Arieff and Yacorzynski reported an average fall of 6 points of Binet I.Q. in 27 cases. Collins found deterioration in 65 epileptics out of 106 over a period of 12 years.

EXTENT OF VARIATIONS.

The extent of the variations in the I.Q. of the series is shown in Table IX. The table shows that of 186 rises of I.Q., 75 (42.5%) were greater than 5 units of I.Q., and of 129 decreases of I.Q., 41 (31.8%) were of more than 5 units. The numbers of re-tests of S.A. which gave a variation of more than 5 years were 145 (77.2%) of 188 increases, and 98 (71.5%) of 137 decreases. The degree of large numbers of variations is, therefore, considerable. If the smaller variations were due solely to chance fluctuations, the ratio of rises to falls would be equal. This is not so.

LEARNING.

The increases in the I.Q. results have now been shown not to be due to sex or chronological age. It is possible that they are due to an increase in knowledge, or an increase in the powers of the subjects. The defectives are known to have asked each other the answers to questions at which they had failed, so the possibility exists that the higher I.Qs. are due to this factor. Nevertheless, as no retest was given at a shorter period than six months after the previous test, and some were given as much as 18 months later, the subjects must have been able to retain their knowledge so acquired for many months.

Many subjects were given Wechsler's Vocabulary Test at the time of their estimation of their I.Q. for the computation of which the vocabulary results are not used.

TABLE IX.—*Extent of Variations between Adjacent I.Qs. and S.As.*

S.A. range. (years).	Number of		I.Q. range. (years).	Number of	
	Rises.	Falls.		Rises.	Falls.
1-5	53	39	1-5	111	88
6-1	39	27	6-10	45	32
11-15	33	25	11-15	16	6
16-20	24	17	16-20	7	3
21-25	18	11	21-25	7	0
26-30	12	8			
31-35	7	5			
36-40	2	0			
41-45	7	2			
46-50	3	3			
	145			75	
	98			41	

The Digit Span test, which consists of the repetition of some numbers forwards and of others backwards, is included in the calculations for the I.Q.

A comparison of the changes in re-tests of the vocabulary with the changes in re-tests of the Digit Span sub-test will give an indication as to whether the rises in the I.Q. are due to long memory (learning) or due to increase in the powers of attention.

Tables X and XI show that in the total series of each table re-test results gave no more rises than falls in the Digit Span. Consequently the rises of I.Q. are not due to an improvement in attention. If the rises are due to learning, the Vocabulary Test would be expected to show more rises than falls. This is the case, as shown by Tables XII and XIII. The percentages of rises do not vary with the Intelligence Quotient. The defectives are learning at chronological ages of from 10 to 60 years, and at I.Q.s from 40 to 121.

TABLE X.—*Changes in Digit Span on One Re-test at Various Chronological Ages.*

Chr. ages.	Rises.	Stationary.	Falls.	Totals.
10-20	22 (22.4)	41	35 (35.8)	98
21-30	42 (33.3)	44	40 (31.7)	126
31-40	20 (32.3)	17	25 (40.2)	62
41-50	14 (45.2)	11	6 (19.3)	31
51-60	4 (40.0)	5	1 (10.0)	10
Totals	102 (31.2)	118	107 (32.8)	327

TABLE XI.—*Changes in Digit Span on One Re-test at Various I.Q.s.*

I.Q.	Rises.	Stationary.	Falls.	Totals.
40-50	7 (31.8)	11	4 (18.2)	22
51-60	29 (26.8)	55	24 (22.2)	108
61-70	38 (36.5)	30	36 (34.5)	104
71-80	28 (38.9)	19	25 (34.8)	72
81-90	9 (37.5)	6	9 (37.5)	24
91-121	6 (28.5)	7	8 (38.1)	21
Totals	117 (33.3)	128	106 (30.2)	351

TABLE XII.—*Changes in Vocabulary Test on One Re-test at Various Chronological Ages.*

Chr. ages.	Rises.	Stationary.	Falls.	Totals.
10-20	45 (36.3)	48	21 (18.4)	114
21-30	70 (47.2)	34	44 (29.7)	148
31-40	28 (38.9)	24	20 (27.8)	72
41-50	19 (52.7)	7	10 (27.8)	36
51-60	6 (60.0)	4	0	10
Totals	168 (43.2)	117	95 (25.0)	380

Table XII shows that the percentage of falling vocabulary scores is not increasing with advancing age. In fact, the percentage of rises increases after the age-group 31-40 years. This agrees with Roe and Shakow's results. These authors found that vocabulary superiority increases with increasing age.

TABLE XIII.—*Changes in Vocabulary Test on One Re-test at Various I.Qs.*

I.Q.	Rises.	Stationary.	Falls.	Totals.
40-50 .	11 (50.0)	9	2 (11.0)	22
51-60 .	51 (38.5)	49	34 (25.4)	134
61-70 .	46 (43.3)	33	27 (25.4)	106
71-80 .	34 (50.0)	17	17 (25.0)	68
81-90 .	12 (44.5)	9	6 (22.2)	27
91-121 .	13 (59.2)	2	7 (31.8)	22
Totals .	167 (44.2)	119	93 (24.6)	379

CONCLUSIONS.

These investigations show that the I.Q., as calculated by the Wechsler (Verbal) Scale, rises in more cases than it falls. These increases are not due to an excess of rises in the Digit Span sub-test, as the proportions of increases and decreases in this test are equal. The increases are therefore due to an accumulation of rises in the remaining sub-tests. The Vocabulary Test shows more rises than falls (see Table XIV).

TABLE XIV.—*Percentage Changes on Re-test.*

	Rises.	Stationary.	Falls.
I.Q.	47.8	21.0	31.4
Vocabulary*	43.7	30.8	24.8
Digit Span*	32.3	36.3	31.4

* Summation of Tables XII and XIII, and of X and XI.

The results indicate that a proportion of defectives, with I.Qs. from 40 upwards, are able to acquire and retain new abstract knowledge up to and including the chronological age-group of 50-60 years.

This property is not, however, an indication of good prognosis, as can be realized from the results of the Digit Span sub-test given above. In fact, Earl found that the outlook for high-grade defectives was better in those who scored higher on certain performance tests than on vocabulary and verbal absurdities tests, and worse in those who scored in the reverse way.

The increase of I.Q. at all chronological ages investigated is an argument for the continued education of the defective beyond the usual school-leaving age of 16 years. The suggestion is put forward that evening classes should be

continued, certainly up to the age of 50 years, for all defectives who have not been shown to be further ineducable.

My thanks are due to Dr. J. Lyons, Medical Superintendent at Hortham Colony, for permission to carry out investigations and to issue these results.

REFERENCES.

- ARIEFF, A. J., and YACORZYNSKI, G. K. (1942), *J. Nerv. Ment. Dis.*, **96**, 49.
BARNES, M. B., and FETTERMAN, J. L. (1938), *Arch. Neur. Psychiat.*, **40**, 903.
COLLINS, A. L. (1941), *J. Psychol.*, **11**, 359.
EARL, C. J. C. (1940), *J. Ab. Soc. Psychol.*, **35**, 428.
KUHLMAN, F. (1921), *J. Appl. Psychol.*, **5**, 192.
ROE, A., and SHAKOW, D. (1942), *Ann. N.Y. Acad. Sci.*, **42**, 361.
RUBISOFF (1940), *Psychol. Bull.*, **37**, 577.
WECHSLER, D. (1944), *The Measurement of Adult Intelligence*, 3rd edit., 28.
-

COMPARISON OF THE INTELLIGENCE QUOTIENT WITH BEHAVIOUR.

By G. DE M. RUDOLF, M.R.C.P., D.P.H., D.P.M.,

Visiting Psychiatrist, Hortham Colony, Bristol.

[Received March, 23 1949].

COMPARISON of different tests performed on the same individual is of value in showing whether tests purporting to be testing the same properties are, in fact, doing so, and also in determining whether certain psychological characteristics tend to occur concurrently in the same subjects. Previous work (Rudolf, 1948) has shown that the accumulation of general knowledge based on the environment and excluding school work, as shown by the I.Q. obtained by the use of Kent's test, correlates highly with the I.Q. obtained by the use of the Stanford Revision of the Binet-Simon, the coefficient being $+0.7499 \pm 0.019$. With a test of reasoning, Raven's Progressive Matrices (Group), the correlation-coefficient of the Kent Test was less impressive, being $+0.2686 \pm 0.038$. These results suggest that the accumulation of knowledge of the environment is not markedly dependent on, or connected with, the powers of reasoning.

In these investigations the behaviour of the individual was not considered. Yet the external attitude towards one's fellows is most frequently the characteristic by means of which people are judged.

PRESENT INVESTIGATION.

The present investigation compares behaviour with I.Q. The Wechsler Bellevue Test for Adults was used for the last and Doll's Social Maturity Scale for the first.

(1) *Tests and Testers.*

Wechsler's Verbal Test, which was the scale used, is a battery of five sub-tests, these dealing with information of a general and scholastic nature, with the comprehension of everyday matters, with arithmetic, with the repeating of digits, and with the similarities of pairs of objects named. The results are recorded in terms of I.Q. Mental ages cannot be calculated from the scores above the age of $15\frac{1}{2}$ years, this mental age corresponding to a score on the verbal scale of 46.

Doll's Social Maturity Scale gives a description of the subject's behaviour as recorded by an observer. The maximum Social Age is 25 + years and a Social Quotient can be obtained by dividing the S.A. by the chronological age. In view of the difference of the maximum ages in the calculation of the S.Q.

and the I.Q., comparison of the two quotients is not strictly fair. In addition, a statement that an individual behaves like a child of a certain age is of more value than the statement that he behaves as does a person of one-half, one-quarter, etc., of his age. In this investigation, therefore, the Social Age, and not the Social Quotient, has been used.

As behaviour alters as the outlook, training, etc., change, no tests have been used in this work if the time-interval between the obtaining of the I.Q. and the S.A. was greater than two months. A total of 1,519 tests was carried out on the same subjects. Of these, 1,076 are considered here, the remainder being unsuitable for comparison.

The tests were performed by testers who were fully qualified nurses working in a mental deficiency colony. They were all trained in testing by one psychiatrist, so that the standard was approximately similar throughout. The training consisted of lectures dealing with intelligence and with the individual tests used. Practical work comprised testing each other and, finally, the testing of mental defectives under the supervision of the psychiatrist.

(2) Subjects.

The subjects investigated were mental defectives resident in a colony. They numbered 281 males and 247 females, and the chronological ages extended from 10 to 57 years.

(3) Results.

The results are shown in Table I, which shows that the majority of cases with I.Q.'s of from 40 to 50, showed S.A.'s of 4 to 8 years; from 50 to 60, of from 4 to 12 years; from 60 to 70, of from 6 to 14 years; from 70 to 80, of from 8 to 18 years; from 80 to 90, of from 8 to 16 years. The cases with higher I.Q.'s are too few for rough inspection.

The correlation-coefficient is significant, being $+0.93 \pm 0.043$.

TABLE I.—*Wechsler Verbal I.Q. and Doll's S.A. on Same Subjects*
S.A. (in years).

Wechsler I.Q.	2—	4—	6—	8—	10—	12—	14—	16—	18—	20—	22—	24—	
40—	3	7	10	3	..	..	..	..	..	..	..	..	23
50—	3	23	54	51	23	7	0	2	..	..	..	..	163
60—	1	7	29	49	36	13	7	2	..	..	..	..	144
70—	..	2	8	23	38	14	14	14	2	..	..	..	115
80—	..	4	4	9	9	9	8	3	6	..	..	..	52
90—	..	..	..	2	8	2	3	2	..	..	..	..	17
100—	..	..	..	..	1	2	4	2	0	0	0	1	10
110—	..	..	..	..	1	1	1	..	..	..	..	..	3
120—	..	..	..	..	1	..	..	..	..	..	..	..	1
	7	43	105	137	117	48	37	25	8	0	0	1	528

The Social Maturity Test, being a scale of behaviour, is affected by physical or emotional disabilities. Individuals may score low on the test as they

cannot, owing to these hindrances, use their maximum intelligence. A score low in proportion to the I.Q. may be due to these factors. It may, however, be due to lack of encouragement and training and the table shows the approximate maximum that can be expected at the different I.Q.'s. Table II has been constructed to show the S.A.'s that should be attained by all cases at the various I.Q.'s, providing physical and emotional disabilities are not present in sufficient degree to interfere with behaviour.

TABLE II.—*Social Ages that can be Attained at Varying I.Q.'s providing no Physical or Emotional Disability Acts as a Hindrance.*

I.Q.	S.A.
40—	4-8
50—	6-12
60—	8-16
70—	10-18
80—	8-20

The possibility must not be denied that, with further training, these S.A.'s can be exceeded.

SUMMARY.

1. Comparison of behaviour, as represented by Social Age and I.Q. (Wechsler-Bellevue, Verbal) has been made in 1,076 tests on 528 male and female defectives.

2. The correlation-coefficient was $+0.93 \pm 0.043$.

3. A scale of Social Ages that should be obtained at I.Q.'s from 40-90 has been constructed. This scale is inapplicable if physical or emotional disabilities prevent the full use of the intelligence.

My thanks are due to Dr. J. Lyons, Medical Superintendent at Hortham Colony, for permission to carry out investigations and to issue these results.

REFERENCE.

RUDOLF, G. de M. (1948), *J. Ment. Sci.*, **94**, 452.

PARANOID REACTION DURING THE PHASE OF RECOVERY FROM SUBARACHNOID HAEMORRHAGE.

By MAURICE SILVERMAN, M.B. Leeds, D.P.M. Eng.

Capt., R.A.M.C.; Psychiatrist, The Military Hospital, Singapore.

BRAIN and Strauss (1945) emphasize that a patient recovering from the immediate effects of rupture of a congenital intracranial aneurysm may show "some reduction of mental function, varying from impairment of memory and inability to concentrate to more serious disturbances." They add, "The importance of these residual symptoms lies in the possibility that they may lead to faulty diagnosis if the patient is first seen some time after the leakage which produced them." In view of the significance of this eventuality, the following case is of relevant interest. I saw the patient for the first time when the paranoid features were already the most prominent clinical manifestations of the case.

CASE HISTORY.

The patient was an Indian medical practitioner, being a Bengali, aged 53. He was a Hindu, married, and had been resident in Malaya for the preceding twenty-two years.

On 1 April, 1948, he was admitted to the General Hospital, Singapore, under the care of Prof. Ransome. His sole symptom was intense headache, referred to the occiput. There was a history of hypertension during the past four years, but there was nothing relevant in his family history. On examination no pyrexia was in evidence, the pulse was 76, and the respiratory rate was 24 per min. The pupils were small and equal, the reactions to light and accommodation being normal. The tendon reflexes and abdominal reflexes were present but sluggish, and the plantar responses were extensor. No loss of voluntary power was detected. The fundi showed mild bilateral papilloedema, the veins being congested and tortuous, compressing the arteries. The latter were narrow, and no exudates or haemorrhages were seen. The only positive signs in the cardiovascular system were an accentuated aortic second sound and a B.P. of 200/120. No abnormal signs were in evidence in the respiratory system or abdomen. Urinary examination was negative. Lumbar puncture showed a uniformly blood-stained fluid, which did not clot on standing. When the red cells settled, the supernatant fluid was xanthochromic. The pressure was raised to 400 mm. Some relief from the headache was experienced following the lumbar puncture and further alleviation of symptoms followed venesection (4 oz. withdrawn). The blood urea—taken on the day of admission—was 45 mgm. per 100 c.c., and a specimen of blood taken on the same day showed a negative Kahn reaction.

During the ensuing days the following points were noted :

- 2 April, 1948 : Mild fluctuating headache in the occiput.
- 3 April, 1948 : Headache present throughout the day, being severe from noon. Nausea present.
- 4 April, 1948 : No headache.
- 5 April, 1948 : In the morning, excruciating headache. Later in the day, heaviness in the head only. Lumbar puncture shows a fluid stained a pale red under a pressure of 400 mm.
- 6 to 10 April, 1948 : Heaviness of the head only.

11 April, 1948 : First evidence of irritability, mild confusion, and lack of co-operation ; patient refusing lumbar puncture.

12 April, 1948 : Condition approximates to that of previous day, though L.P. successful. C.S.F. is pale yellow, under a pressure of 360 mm., diminishing to 150 mm. in 30 secs after the withdrawal of 7 c.c. C.S.F.

13 and 14 April, 1948 : Mild confusion continues. Slight pain at the back of the neck.

15 April, 1948 : Confusion more marked. Restless. Suspicious of the medical staff, refusing medicines and wishing to leave the ward.

On 16 April, 1948, I was asked to see this patient. He was an Indian of good average build. He was somewhat distraught, mildly confused, and much of his conversation was disconnected. However, there was no gross incoherence, and the basic logic of his speech was easily discernible. He was manifestly suspicious, and added that he was only speaking to me because Prof. Ransome had asked him to do so, emphasizing that he would never have conversed with me otherwise. Prof. Ransome was the only person in the hospital whom he trusted, and he resented all other medical men. He began reminiscing on his experiences since 1933, going into an excessive amount of detail about these, and though it was difficult to interrupt this flow of speech, the latter was not of the typical schizophrenic variety. When I attempted to intervene, he reacted immediately by saying that I was prejudiced against the Indians. "I know it instinctively," he said, repeating this phrase at frequent intervals. "You are against the Indians. I am sorry. I am quite frank. You don't like the Indians. You know it. That is why I refuse medicines from the doctors. That is why I don't want to stay in the ward." At this point he became melodramatic in his behaviour, speaking slowly and deliberately, with emphatic gesticulations. He became more resentful and guarded in his speech, reiterated his accusations against me, and finally refused to continue speaking in the absence of Prof. Ransome. When Prof. Ransome arrived, the patient continued to elaborate his paranoid ideas, talking profusely and incessantly, and, on occasions, becoming excited and agitated. "You are against me," he added. "I am sorry. I know it." He was correctly orientated for time, place and person, knowing his length of stay in hospital, the locale of his practise, and being able to identify others around him. In reply to questioning, he said he had no worries and was happily married. No hallucinations were in evidence, but insight into his condition was poor. The affect varied with the thought content, the agitation and excitement increasing in intensity when the paranoid ideas were being expressed.

Patient was discharged from hospital on the day following this interview, and placed under the care of his family. He continued to be restless, irritable and paranoid. On May 1, 1948, for example, it was noted that "He argues on everything."

On 9 May, 1948, he still had periods when he was "irritable, talkative, and rambling in his speech."

However, his condition gradually subsided, and by 20 May, 1948, he was able to attend his surgery on a part-time basis. The restlessness and suspiciousness were no longer in evidence, and the only symptom was slight pain at the back of the head. Since then his progress has been well maintained, and further improvement has taken place.

On 15 June, 1948 (i.e. the time of writing) his general practitioner informed me that when patient heard that I had inquired about his health, he requested the practitioner to apologize on his behalf for his "rudeness" when I had interviewed him. No paranoid ideas were present, and he was continuing to attend his surgery in the mornings.

COMMENT

Though this patient was a hypertensive subject, the paranoid reaction was limited to the period of recovery from the subarachnoid haemorrhage. It seems unlikely, therefore, that his psychological condition was merely a manifestation of his hypertensive state. In the literature available here, it is noted that in the section on subarachnoid haemorrhage in the *Text-book of Medicine* edited by F. W. Price (1941), the only psychiatric conditions mentioned are

"periods of mental confusion and drowsiness." No reference is made to the possible occurrence of a paranoid reaction. Brain and Strauss (1945) observed a patient with maniacal attacks who had been certified insane. Though Kinnier Wilson (1944) referred to euphoria and "Witzelsucht," the sole specific psychiatric picture mentioned by him was the Korsakow syndrome. The latter has been discussed by Hall (1929) and recorded by Cubitt (1930). Goldflam (1923) wrote: "In nearly all cases (of subarachnoid haemorrhage), at the height of the illness, certain psychic disturbances are observed, such as disorientation as regards time, place, and persons."

On the prognosis of the psychiatric symptoms, Goldflam (1923) observed: "It is good in subarachnoid haemorrhage, for the psychic disturbances disappear completely. It may be assumed that the emotional changes in these cases are of a temporary nature, and that the alterations in the cortex brought about by the extravasations of blood are capable of complete regression." Kinnier Wilson (1944) supports this view. "As a general rule," he says, "all such mental disorders clear up in due course, leaving little or no trace behind." The case described here would appear to agree with this prognostic generalization. Though he was still excessively suspicious when it was decided to discharge him from hospital, his further progress suggests that this procedure was not unjustifiable. A month later his mental condition had returned to normal. The paranoid features had completely subsided, and insight was so good that he was apologizing for various statements made by him whilst in his paranoid state.

SUMMARY.

A case of "spontaneous" subarachnoid haemorrhage manifesting a paranoid reaction is described. The psychiatric symptoms were limited exclusively to the recovery phase of the intracranial catastrophe.

The importance of these symptoms is emphasized from the standpoint of differential diagnosis.

Reference is made to other psychiatric abnormalities which have been recorded during the recovery phase of subarachnoidal haemorrhage, and the good prognosis for the former noted in the literature is supported by the case described.

I am most indebted to Prof. G. A. Ransome, of the General Hospital, Singapore, for allowing me access to the case notes of this patient. My thanks are due to Brig. T. Young, O.B.E., D.M.S., Far East Land Forces, for permission to publish, and to Dr. M. Abraham for his assistance with some of the medical records.

REFERENCES.

- BRAIN, W. R., and STRAUSS, E. B. (1945), *Recent Advances in Neurology and Neuro-psychiatry*, 5th edition, J. & A. Churchill Ltd.
Textbook of the Practice of Medicine. Edited by F. W. PRICE (1941). Section on Diseases of the Nervous System, revised by F. M. R. Walshe. Oxford Medical Publications.
 WILSON, S. A. KINNIER (1944), *Neurology*, 2, E. Arnold Ltd.
 HALL, A. J. (1929), *Brit. Med. J.*, 1.
 CUBITT, A. W. (1930), *Ibid.*, 2.
 GOLDFLAM (1923), *Deut. Zeit. f. Nervenheilk.*, 76, 158.

PORENCEPHALY AND CEREBRAL ABSCESS SIMULATING INTERNAL HYDROCEPHALUS.

By BRIAN H. KIRMAN, M.D., D.P.M.

From the Fountain Hospital, Tooting, London, S.W. 17.

[Received 30 December, 1948.]

COURVILLE (1945) remarks that : " It was almost a medical habit in England on the part of physicians with literary leanings in the first half of the nineteenth century to write an essay on ' water on the brain '." It was not, however, until the experimental work of Dandy (1917) was published that a dynamic and scientific approach to the problem became possible. To this day no generally effective and applicable method of treatment has been devised. This is possibly due in part to the tendency to lump together a variety of conditions of different aetiology and pathology under the one heading. To emphasize this point it is perhaps useful to publish the following case, which clinically seemed to be one of simple hydrocephalus, but post-mortem examination of which showed that the symptoms had quite a different origin.

CASE HISTORY.

Born 19.x.41; illegitimate. Nothing significant in the family history on either side. There is a normal half brother ten years older than the patient. The mother tried to bring about an abortion, otherwise pregnancy and delivery were normal. The mother (a writer who had had several books published) was 33 at the birth of the patient. Enlargement of the head and backwardness were noticed shortly after birth. The child was admitted to hospital aged 14 months, and was then unable to stand, sit, or lift his head. He was blind from optic atrophy. The head circumference was $20\frac{1}{2}$ in., the length of the skull $6\frac{3}{4}$ in. and the breadth $5\frac{3}{4}$ in. Otherwise he appeared very well nourished and in good general health. He was classed as an idiot and diagnosed as a case of hydrocephalus. There was no improvement in his condition from his admission to the time of his death on 23.viii.47. He never became able to play or to take any active interest in his surroundings. He had a major epileptic fit in 1946. On several occasions throughout his stay in hospital he had bouts of pyrexia reaching to 105 degrees. His death occurred at the end of one such bout. A lumbar puncture done on the day prior to death showed a normal cerebro-spinal fluid. All the febrile episodes were accompanied by vomiting and by drowsiness increasing in depth to coma at times. No cause for the pyrexia was found and the possibility of derangement of the heat regulating mechanism due to hydrocephalus was considered.

At post-mortem examination there was an incipient broncho-pneumonia. The skull was very much thickened, measuring $1\frac{7}{8}$ in. at the thickest part, the vertex, and showing coral markings on the inner surface to the left of the vertex, the hypertrophied area also extended somewhat to the right of the mid-line (see photograph and X-ray films). The weight of the skull vault when removed was 14 oz. (Figs. 1 and 2). The meninges were firmly attached to this abnormal area and showed a ragged appearance when stripped (Fig. 3). The head as a whole was disproportionately large to the body and the skull was globular with a bulge forward over the eyes, which is usually regarded as characteristic of hydrocephalus (*cf.* A. F. Tredgold, 1947, " The peculiar enlargement of the skull makes diagnosis

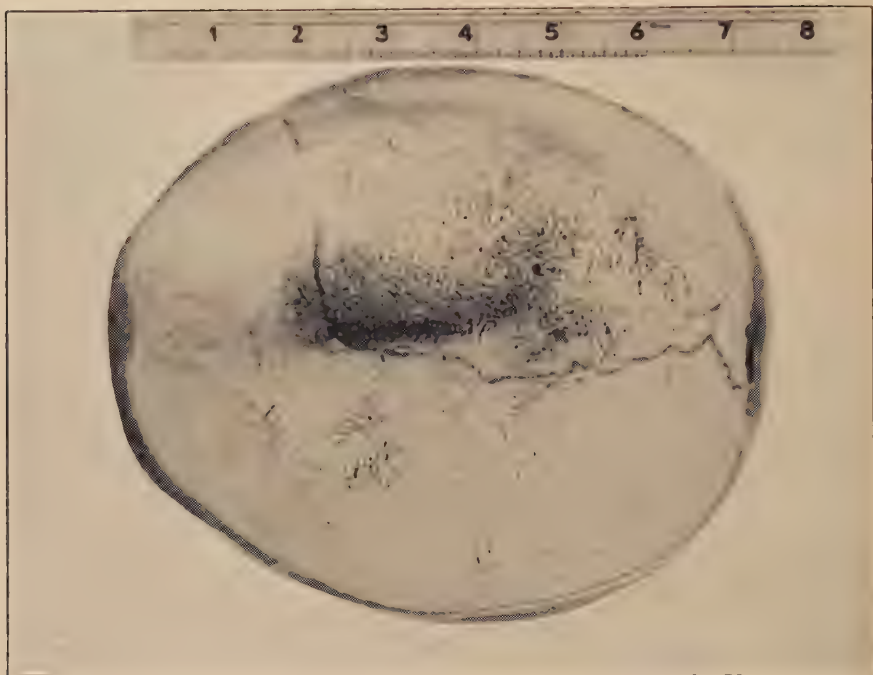


FIG. 1.—Photograph of cranial vault showing hairbrush marking corresponding to site of cerebral abscess. Note partial obliteration of sutures.



FIG. 2.—X-ray of cranial vault showing disturbance of normal bone architecture corresponding to site of cerebral abscess.

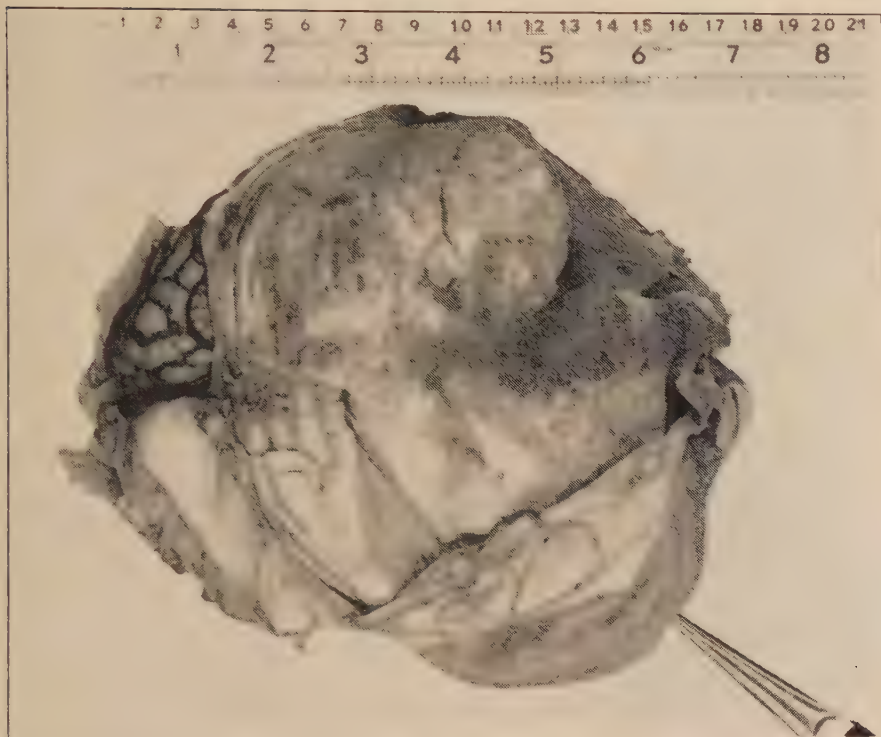


FIG. 3.—Superior view of brain showing thickening of meninges over site of cerebral abscess and ragged appearance where detached from skull.

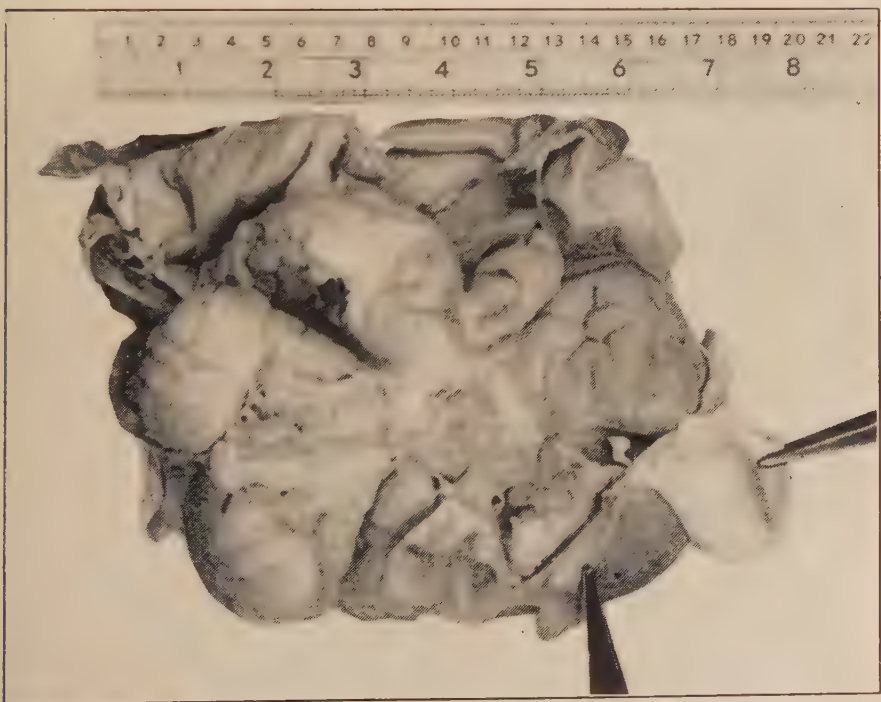


FIG. 4.—Inferior aspect of brain showing thickening of meninges, adhesions and openings to cavities on both sides.

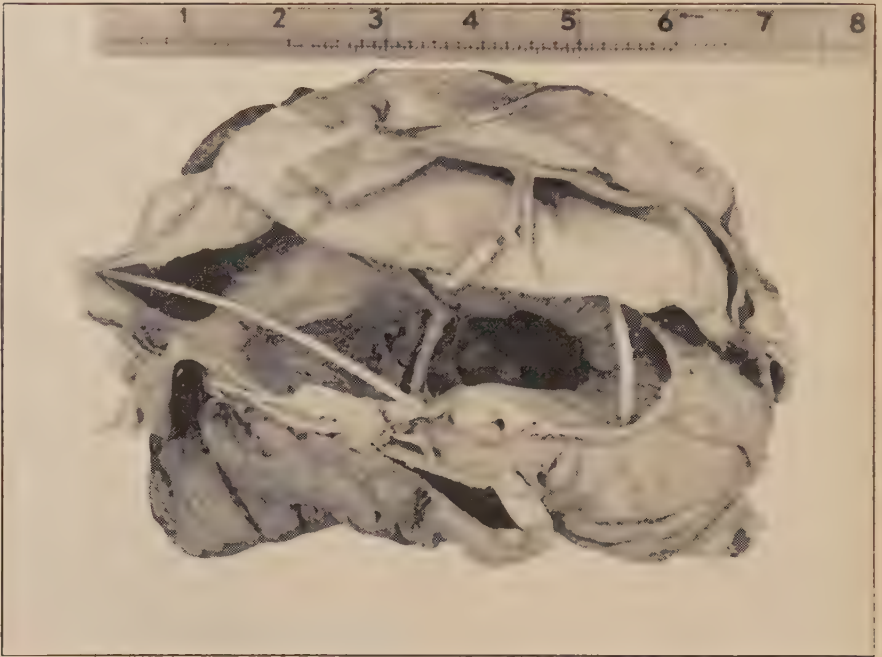


FIG. 5.—Lateral aspect of brain showing large porencephalic cavity occupying almost the whole of the right hemisphere traversed by several fibrous cords.

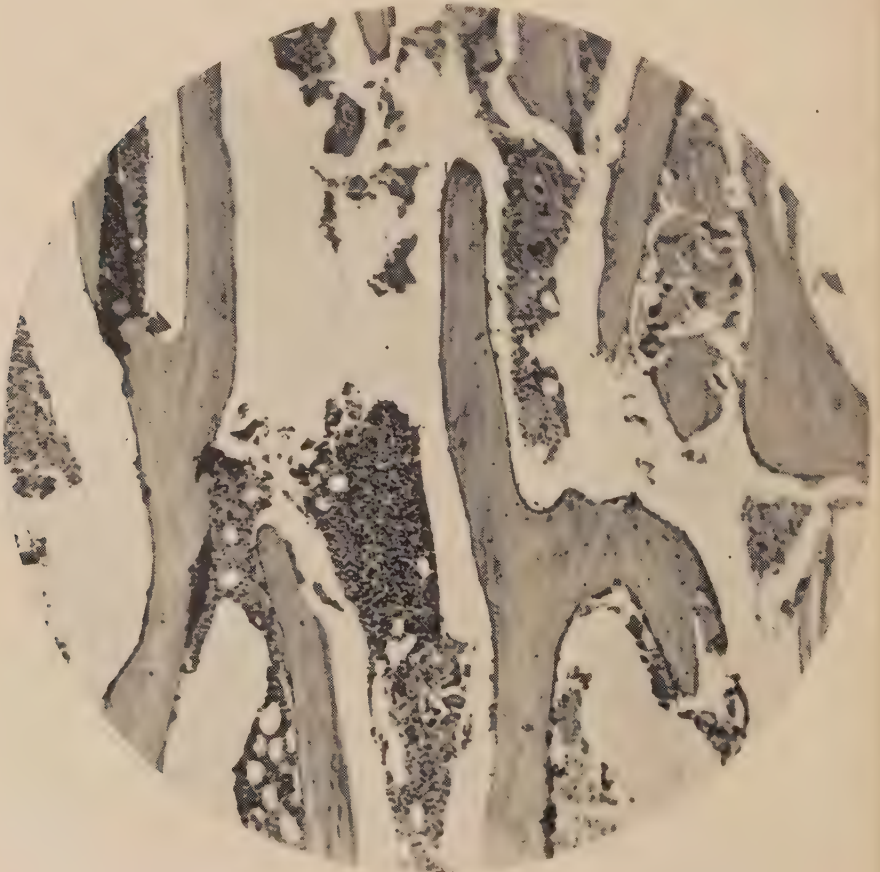


FIG. 6.—Section of bone from skull vault at site corresponding to that of cerebral abscess.

easy."'). The length was $7\frac{1}{2}$ in. and the breadth 6 in. The fontanelles were closed and the sutures had in places entirely disappeared. There were no Wormian bones. In general, the union between the individual bones was so effective that the cranium could be said to consist of one piece.

Both sides of the brain (see Fig. 4) were distended and approximately equal in size. On the right there was little brain substance and the hemisphere which was filled with clear fluid showed a condition of porencephaly. On the left there was more brain substance and the cavity was filled with thick, yellow pus. On microscopy this pus showed degenerate polymorphonuclear leucocytes and diplococci. On culture pneumococci, staphylococci (*aureus*) and *B. Friedlander* were grown. It was assumed that this was a chronic pneumococcal abscess which had been responsible for the obscure pyrexia.

A report from Dr. Turner McLardy, of the Maudsley Research Laboratory, states:

"Brain weight: 1040 gm.

"In the *left hemisphere* the temporal pole was completely replaced by a smooth-walled cyst lined superficially by pia-mater. The whole of the white and grey matter of the frontal lobe except in the most mesial 1 cm. of its substance was replaced by a ragged-walled cavity. This cavity had no apparent connection with the temporal cyst or with the ventricular system. It was lined dorsally by thickened leptomeninges and dura mater, which contained a thick layer of sub-dural haematoma.

"In the *right hemisphere* (see Fig. 5) the temporal lobe showed the same condition as on the left side, but here the superior and middle temporal gyri were also extensively involved and the defect formed part of a large single cavity which replaced also the whole of the parenchyma of the occipital lobe and of the dorsal half of the frontal and parietal lobes. This cavity was continuous with the entire length of the lateral ventricle and was covered dorsally by thickened leptomeninges. It was smooth-walled throughout and traversed by several fibrous cords, one of which corresponded in position to the posterior pillar of the fornix. There was no evidence of corpus striatum or thalamus in this hemisphere. In the left hemisphere the basal ganglia were not accessible to inspection.

"Hypothalamic structures, except for sclerosed remnants of the optic chiasma and nerves, were obscured by dense fibrosis. The arteries of the base appeared normal in consistency. The cranial nerves (other than first and second) appeared normal on the right, but the fifth and sixth could not be identified on the left. Midbrain, pons and medulla appeared normal. The right cerebellum was slightly smaller than normal.

"There is no doubt that this is a widespread bilateral porencephalic process in the main, probably not of the schizencephalic type described by Yakovlev and Wadsworth. The cavity in the left hemisphere had probably been infected from the septic focus in scalp and skull."

Dr. M. K. Beattie, of the Central Pathological Laboratory, West Park, reports on the histology of the skull cap as follows:

"There is considerable dilatation of the Harvesian canals and marrow spaces which appear more variable in size and shape than normal. The lacunae also in parts are larger and more variable. The general pattern is more irregular and the inner compact layer of bone appears to be defective." (See Fig. 6.)

DISCUSSION.

The inclusion of external and internal hydrocephalus under the same general head tends to obscure a proper appreciation of the subject. External hydrocephalus is, of course, a purely static accumulation of fluid in those instances where there is loss or non-development of cerebral substance. Internal hydrocephalus (including both communicating and non-communicating varieties which are clinically identical), on the other hand, is a dynamic and menacing phenomenon which is invariably fatal unless arrested. The case under discussion presented clinically the features of the latter type. Study of the

cerebral anatomy was rendered more difficult by the great distension of the brain and the adhesions consequent on abscess formation, but if the porencephalic interpretation of the findings is correct then a diagnosis of non-communicating hydrocephalus is out of the question since the essential feature of porencephaly is that it is an inadequacy of the roofing-in process which normally isolates the ventricular system from surface of the brain except for the foramina in the roof of the fourth ventricle.

It should be pointed out, however, that Yakovlev in discussing this problem (1946) draws attention to the persistence of a thin membrane, sufficient in many cases to form a complete roof to the cavity, and to confine a hydrocephalic swelling which he ascribes merely to a disturbance of the hydrostatic balance due to the localized thinning of the cerebral wall. The persistence of a membrane representing the attenuated cortex is also well described by Turnbull (1904).

The state of the skull rules out also the diagnosis of a simple progressive type of internal hydrocephalus for in these cases the skull is excessively thinned and the individual bones widely separated where the lesion has developed before or shortly after birth, that is before union of the sutures. The great thickness of the skull was one of the outstanding features of this case and accounted for a considerable part of the clinical increase in the size of the head.

Porencephaly is usually divided into "true" and "false" (Buzzard and Greenfield, 1921). The validity of this division is, however, open to doubt (Kinnier Wilson, 1940) since it is probable that some at least of the "true" cases are instances of malformations resulting from interference with the circulation of the brain during pregnancy (Marburg, Rezek and Marks, 1945), just as the "false" cases are due to a similar disturbance in later life. As Dandy and Blackfan, referring to hydrocephalus, state, "such sub-divisions do not clarify the pathogenesis, but serve to obscure it."

Yakovlev (1946) separates porencephalies into encephaloclastic types with a normal cerebral "blue-print" and the schizencephalic type in which the "blue-print" was abnormal.

Déjerine (1898), using the terms "porencephaly" and "hydrocephalus" as interchangeable, makes a similar distinction, likewise based on a study of cortico-thalamic connections.

The origin of the cerebral abscess is obscure. The child developed a pyrexia of unknown origin soon after admission to hospital and continued to have similar bouts throughout its stay, that is for a period of nearly five years. It seems highly probable that the abscess had been present for the whole of this time. This would account for the extreme thickening of the skull cap and for the chronic appearance of the meningeal adhesions. It is unlikely that the occipital pressure sores which developed only terminally could have been responsible for the infection, particularly inasmuch as the outer table of the occipital bone showed no abnormality.

Grüneberg (1947) lists a number of types of hydrocephalus in rodents, including four inherited varieties in mice which have a suggestive bearing on the human condition. Evidence of inheritance of recessive factors in humans is, however, not always easy to obtain and in the absence of such definite proof

undue emphasis should not be placed on the hereditary aspect. On the contrary, the search for pre- and post-natal environmental factors should be intensified. This search will be more successful if the heterogeneous groups which are at present labelled hydrocephalus, porencephaly, etc., are subjected to more critical scrutiny and broken down into their component parts. This will enable the importance of pre-natal infections, of blood incompatibilities, of nutritional factors or even as in the present case, of unsuccessful attempts at abortion (*cf.* Penrose, 1933) to be more accurately assessed.

SUMMARY.

A case of porencephaly with cerebral abscess simulating congenital hydrocephalus is described. There was bilateral porencephaly with a unilateral pneumococcal abscess which had probably been present from the first year of life, as indicated by recurrent bouts of unexplained fever. The division of porencephaly into true and false types is criticized and the importance of study of environmental factors in both porencephaly and hydrocephalus is emphasized.

BIBLIOGRAPHY.

- BUZZARD, A. F., and GREENFIELD, J. G. (1921), *Pathology of the Nervous System*, pp. 51, 56 and 121. London.
- COURVILLE, C. B. (1945), *Pathology of the Central Nervous System*, p. 74. Mountain View.
- DANDY, W. E., and BLACKFAN, K. D. (1914), *Amer. J. Dis. Child.*, **8**, 406.
- Idem* (1917), *ibid.*, **14**, 424.
- DÉJERINE, J., and LONG, E. (1898), *C. R. Soc. Biol., Paris*, **5**, 1131.
- GRÜNEBERG, H. (1947), *Animal Genetics and Medicine*, p. 49. London.
- MARBURG, O. M., REZEK, P. R., and MARKS, M. B. (1945), *J. Neuropath. Exp. Neur.*, **4**, 43.
- PENROSE, L. S. (1933), *Mental Defect*, p. 56. London.
- TREDGOLD, A. F. (1947), *A Text-book of Mental Deficiency*, p. 258. London.
- TURNBULL, H. M. (1904), *Brain*, **27**, 214.
- WILSON, S. A. K. (1940), *Neurology*, p. 1451. London.
- YAKOVLEV, P. I., and WADSWORTH, R. C. (1941), *Trans. Amer. Neur. Assoc.*, **67**, 24.
- Idem* (1946), *J. Neuropath. Exp. Neur.*, **5**, 169.

Part II.—Reviews.

CRITICAL REVIEW.

THE FACTS AND METHODS OF CYBERNETICS.

Cybernetics, or Control and Communication in the Animal and the Machine.

By Prof. NORBERT WIENER. New York: John Wiley & Sons. London: Chapman & Hall. 1948. Pp. 194.

Brain-like mechanisms are to-day being built with ever-increasing technical skill. Ten years ago they could hardly be said to exist, but the war urged the development of many new devices: of predictors which could carry out complicated calculations at high speed, of bomb-sights which would automatically correct themselves for transient disturbances, of searchlights which would automatically follow their target aeroplane through all manoeuvres, and other devices too numerous to mention. Many of them were kept secret, and some still are. But enough is known for us to be able to say to-day that machines have abilities not thought possible ten years ago, that the design of these machines rests now on exact principles, and that, in other words, a new branch of science has been created.

The engineers who designed these machines have repeatedly appealed to the physiologists to explain how the brain achieves some of its results: if you will tell us how the brain does it, we will soon make a machine do it, is their reason. Their demand has not always been satisfied, but it persists, for they know that they can learn from the physiologist.

Can the physiologist afford to ignore the machines which are giving an ever more accurate imitation of what the cerebral cortex does? At first sight a network of copper wire with vacuum tubes may seem to have little relation to a network of nerve fibres with cell bodies, but the fact that both are networks provides a common property. The engineers have developed exact methods and fundamental principles relating the structure of a network to its behavioural properties. The application of these principles to the neural network cannot fail to be of interest, and may lead to new discoveries.

Prof. Wiener's book is assured of a welcome, for it is the first to attempt a correlation of the two sciences; of the new mechanics and of cerebral physiology. He has been responsible for some of the significant advances on the mechanical side, and he has enjoyed prolonged professional contact with physiologists such as Rosenblueth and with psychiatrists such as McCulloch. He is therefore unusually well qualified to undertake such a survey. His professional bias towards a mathematical form of statement may lessen his number of readers, but adds to his precision.

Although the subject is not yet widely known, interest in it has grown rapidly. A first Conference on Teleological Mechanisms (1948) was held in New York and aroused much discussion. A more recent conference at the Burden Neurological Institute on 7 May, 1949 (first introducing the subject specifically to Great Britain) showed that no less interest exists here. I propose, therefore, to review briefly the main facts of the new science. I will first outline its origin in physics and mechanics, and will then describe its applications to cerebral physiology and psychiatry. Finally, I will comment more specifically on the book itself.

SYSTEMS WITH FEEDBACK.

Cybernetics treats of the lines of communication which may be established between system and system, of the information which may be transmitted along them, of the control which each part thereby establishes over the other, and of the co-ordination which is thereby achieved. The word seems well chosen, for its origin is *Κυβερνήτης*—a *steersman*. A Latin corruption is *gubernator*—a governor. And elementary cybernetic principles are excellently illustrated by the Watt's governor and by the steering engine.

The steering of a ship involves a circuit of actions. The position of the helm determines the action of the steering engines on the rudder. The position of the rudder determines the rate of turn of the ship. And its turn determines the helmsman's action on the helm. There is, therefore, a *circuit* of actions, and this circuit gives the system unusual potentialities both for good and evil.

The system has several properties typical of the mechanisms studied in cybernetics. First, it is abundantly supplied with free energy; the pressure of a finger on the helm is so amplified by the steering engines that ten thousand tons of ship may be moved. The system is, in short, a *servo-mechanism*. Secondly, the system, whether the helmsman is living or automatic, is goal-seeking, for no matter how it may be turned from its course, the internal actions of the system will restore its direction. The system is thus self-correcting; for the error is fed back into the mechanism to cause its own reduction. The reduction, however, depends on the stability of the system; for if the actions of the various sub-systems are not properly related in amplitude and phase, the very action of the mechanism may cause vicious circles of effects to develop: the system, in correcting a small error, may cause a larger error in the opposite direction, and the successive corrections may cause swings of ever-increasing amplitude. If the error is to be reduced quickly, the system must be well-designed.

The design of such systems is now well understood. As the system, to a first approximation, is dynamically linear, the differential equations of its movements may be solved by steady-state analysis. So if the output z is related to the input v by some relation $z = F(p)y$, the application of Nyquist's criterion (1932) to $\tilde{F}(p)$ will show whether the system is stable, and will show what components must be altered in what way if the stability is to be improved.

Such an analysis may first be conducted on the assumption that the steering is controlled by an automatic helmsman: a device by which the deviation of the ship's bearing from that of the gyro-compass initiates the corrective action. Such an automatic helmsman has well-defined properties which appear in $F(p)$. But it has been found that the human helmsman, who performs exactly the same function in the system, has also fairly well-defined properties which can be specified in $F(p)$. The work of Bates and Hick at Cambridge has provided data for such studies, and has shown the extent to which the human nervous system can be treated as a servo-mechanism.

The Watt's governor is similarly well known, for the principle was studied in 1868 by Clerk Maxwell. But the simple governor and steersman have been far exceeded in abilities by modern machines which are now able to perform tasks hitherto requiring a human operator.

One class of such mechanisms, already referred to, is that of the goal-seeking, or self-correcting, machines. Such a machine is the radar-controlled searchlight, which, emitting a beam of pulses and guided by the returning reflections, endlessly scans the sky if no aircraft are about, but which turns towards any reflecting object; once illuminated, the aircraft is held in the beam, which follows it in spite of all manoeuvres. Although the components of searchlight and steering mechanism are very different, the principles of their operation are identical and are, in fact, identical with those operating all goal-seeking mechanisms. They may be stated in several technical forms, but the essential

features are that : the system must contain feedback ; it must be state-determined, i.e. a knowledge of all its variables must be sufficient to determine its behaviour ; and the system must be stable.

The importance of these principles, and of their associated techniques, is that the study of any particular system can use freely the techniques already perfected in the study of other systems. Thus Nyquist's criterion was originally developed for the study of radio amplifiers. There it was perfected in mathematical rigour, was applied to multiple feedbacks, was generalized to apply to non-linear behaviour, and was related to the other tests of stability, such as Routh's (1905). When later the designers of, say, the automatic searchlight used the same principles, the whole technique of Nyquist's method was immediately available. Similarly, the Laplace transform, the Heaviside operator, the delta function, and other methods are also now applied to a range of problems far wider than the original.

Present-day studies of such goal-seeking and self-correcting mechanisms go far beyond the simple forms mentioned so far. The theory of machines which work discontinuously, by impulses, is now well developed. Again, some machines have to use information which is contaminated with random disturbance or "noise." Radar echoes from an aeroplane, for instance, come back irregularly distorted by propeller rotation, by engine vibration and by change from yaw, roll and pitch. The mechanism must discriminate in this mixture so that the components due to aircraft travel are accepted and used, while those due to the other variations are ignored. The principles which must govern such a system are now well known (James *et al.*, 1947) ; and the method for minimizing the disturbances caused by the noise has been defined with quantitative accuracy.

Such self-correcting machines rely on their designer for their stability, but a machine has now been built (Ashby, 1948) which, in a sense, designs itself. It is of the class of goal-seeking machines, but it has the peculiarity that if its internal wiring does not give it stability it will alter its own wiring until stability is achieved. The principle it uses will probably enable yet further developments to occur, for the principle is of extremely wide applicability.

These examples, brief though the description, may illustrate the range and development of the first branch of cybernetics—the relation of structure to goal-seeking behaviour. The relation is now well understood, and it can be stated that all the basic problems are solved, that the principles are firmly established, and that an extensive body of practice and technique is available for application to other branches of science.

GESTALT RECOGNITION.

Another branch of cybernetics deals with the properties a machine must have if it is to respond to a pattern, responding whenever this pattern appears, but not responding if the same elementary stimuli appear in a different pattern. In man it is the problem of the *Gestalt*.

At first, psychologists tended to think that such an ability was exclusively human, or at least mammalian. But a more searching analysis has shown that the ability is not beyond the powers of pure mechanism. The first advance occurred when Pitts and McCulloch (1947) showed that the problem was to embody an *invariant*. If a dynamic system with variables $x_1, x_2, \dots, x_n$ is specified (Ashby, 1945) by equations—

$$\frac{dx_i}{dt} = f_i(x_1, x_2, \dots, x_n) \quad (i = 1, 2, \dots, n)$$

so that its behaviour is specified by their integrals

$$x_i = F_i(x_1^0, x_2^0, \dots, x_n^0; t) \quad (i = 1, 2, \dots, n)$$

where $x_1^0, x_2^0, \dots, x_n^0$ are the initial values, then the stimulus used to set it in motion will be specified by the initial states $x_1^0, x_2^0, \dots, x_n^0$, or more briefly x^0 . Other sets of stimuli, different in detail but identical in *Gestalt*, $x^{0'}, x^{0''}, \dots$ will define a *group* of operators of which a typical one will be Φ , defined by

$$\begin{aligned} x_1^{0'} &= \varphi_1(x_1^0, x_2^0, \dots, x_n^0) \\ &\vdots \\ x_n^{0'} &= \varphi_n(x_1^0, x_2^0, \dots, x_n^0) \end{aligned}$$

To say that some variables j are not altered in their behaviour when stimulus $x^{0'}$ is used instead of x^0 is to say that F_j is an *invariant* of the operator Φ . Consequently, any machine whose integrals are invariant for Φ will show the required property of *Gestalt*-recognition. There is, therefore, no difficulty in theory. If the construction of such machines has been slow, the delay has been due partly to the previous uncertainty of aim, and partly to the mathematical difficulty of discovering suitable invariants.

Nevertheless, the moment Pitts and McCulloch had recognized the true nature of the problem, a comparatively elementary application of the theory of groups was sufficient to suggest one possible solution. One of the simplest invariants of a group is the sum of its transforms, and using this fact, they described a mechanism, simple in principle, which could achieve *Gestalt*-recognition. Another possible method is to convert the behaviour of the system into the fluctuations of a single variable—to convert the spatial distribution into a temporal distribution—for it is well known that the functions F_i form a one-parameter group and are therefore independent of any particular initial time.

COMPUTING MACHINES.

The final branch of cybernetics to be described here deals with computing machines. I refer not to the slide rule and the desk machine, for in them the transmission of information from part to part is trivial. I refer to the big modern electronic computing machines with five or ten thousand vacuum tubes, divided into many sub-systems which work in some independence, but which co-operate to construct the final answer. The designing and perfection of such machines have contributed much to cybernetics; for in them the problems of control and of communication have forced the development of an advanced technique. A full description of these giants would be out of place in this review, so I shall notice only those features of immediate interest.

A first feature is that the more modern of them are arranged so that each part works only in the two degrees of "all" or "nothing." So the message which part sends to part is a train of impulses. Each impulse is identical with every other impulse, so the messages differ only in the temporal distributions of the impulses. Earlier machines used variables which could change continuously over a range of values. But experience has shown that the restriction to a simple alternative gives an improved accuracy and reliability. The significance of this observation will be referred to later.

Another feature is that they are given considerable internal freedom of action. For instance, if a long programme of calculation is to be carried through, divisions will be required from time to time. It has been found advantageous to construct a few sub-systems specially adapted to division, and to leave them free for any other part which requires a division. The part requiring it hunts for an unemployed divider, sends it the numbers, receives back the quotient, and then disconnects from it, leaving it ready for use by any other part. This is only one of its freedoms. The bigger the machine, the more is the internal management of the computing process decided by the machine according to the internal conditions of the moment.

A third feature is that they must have "memory": they must have some way of retaining the results of part of the computation, ready to join other parts of the computation when they, too, are ready. The retention of extensive numerical material, and of complicated but temporary instructions, plays a large and important part in the whole process.

The introduction of freedom and of memory, though it confers great new powers on the machine, also confers possibilities for error not seen in simple machines. Thus, by some peculiarity in a particular computation, by some slight defect, or by some coincidence of action, the machine may develop a functional peculiarity which is regenerative and self-aggravating. A circular process may arise which contains within itself factors intensifying the circular process. Thus, a part A might send to a part B the instruction "Copy what I am doing" at the very moment that B was connected to send a message to A. B would then send A the message "Copy what I am doing"; so A would re-transmit it to B; and the process, once started, would be regenerative. The two parts would be locked functionally, and would form a circuit around which the message would circulate at top speed. A large machine, then, can develop what might be called a "functional" disorder; for the machine, though structurally normal, can develop a mode of behaviour which spoils its normal activities.

Such a disorder has three main effects. The first is that the parts utilized by the abnormal process are no longer available for normal activity; the capacity of the machine is lowered. More serious is the fact that any other part which makes contact with the affected parts will receive from them abnormal and distorted messages which will distort the activities of the other part. The abnormal circuits, in other words, will upset the normal every time the latter make contact with them. Worst of all, however, such abnormal circuits, highly active in a disordered way, tend to bring more and more of the remaining parts into their own disordered activities, until every part of the machine may be drawn in. When this happens, the activities of the machine are totally disorganized, and the results of the "calculations" are mere nonsense.

The study of such functional abnormalities is one of the branches of cybernetics; with it I complete the survey.

APPLICATIONS TO PSYCHIATRY.

Can cybernetics be of use to psychiatry? I think it can, particularly if to psychiatry we add the related sciences of neuro-physiology and psychology; so I shall now outline what I believe to be the most promising applications.

Perhaps the highest and most characteristic of the nervous functions is that of integration. In this process the activities of diverse parts of the nervous system must be so matched that the parts act in unity to a common end. Those who study such a process can hardly ignore a science whose methods, as I said earlier, throw light on the means by which part and part may be brought into communication, on the information which may be transmitted between them, on the control which part may exert on part, and on the co-ordination which is thereby achieved. Thus, as mentioned earlier, it has been shown that the transmission of information by discrete pulses is fundamentally more efficient than any other method. Is it surprising that the brain—the oldest of all communicating systems—should have arrived at the same method? The "all or nothing" property of the axis-cylinder assumes a new significance when we know that any other form would be less efficient.

Such information is said to be "pulsed," like radar, and well tried methods are available for its treatment (e.g. James *et al.*, 1947). For example, when such pulses arrive at the end-organ or synapse they accumulate to build up C.E.S. Under the name of "clamping", such processes are well understood

in radar ; hardly more than a change of name is needed for the whole of this knowledge to be applicable to the synaptic events in the nervous system. The application may well prove fruitful. We shall know soon, for the application cannot be long delayed.

At the next level of complexity above the synaptic, the activities of the nerve cells reach the effectors, and thereby act on the external world. At this level the application of cybernetics is likely to be of far-reaching importance. For it treats these actions, not as disappearing into a void, but as causing a definite reaction from that environment. It treats, in other words, of the interaction between organism and environment. And it treats them by methods which rest not on the metaphysical concepts of purpose, instinct and libido, but on the physical concepts of structure, energy, and dynamics.

The elementary principles of such interaction are shown most clearly at the level of homeostatic regulation. Since Cannon's pioneer work it has become increasingly evident that the homeostatic mechanisms are all in dynamic equilibrium. All have feedback, which is invariably found to be negative. Nor is this surprising ; positive feedback causes a destructive instability, and mutations causing such instability have been eliminated long ago by natural selection.

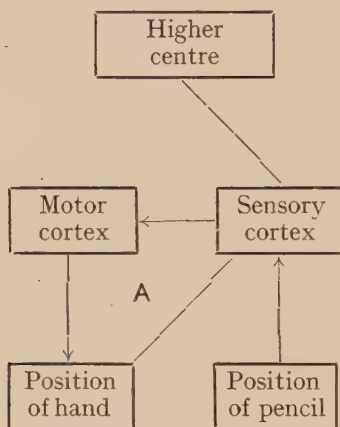
A considerable extension of this application occurred when Ashby in 1940, and Rosenblueth, Wiener and Bigelow independently in 1943, observed that all externally directed behaviour, if it is to be adaptive and not self-destructive, must act homeostatically and must therefore be subject to the laws of equilibrium. Their views rather outlined future research than solved immediate problems ; but the directions for the advance have been made clear. Progress can be made by studying the interaction between organism and environment not only when the environment has some exact form, but also when it is defined only statistically—when only its probable properties are known. To such an environment the organism must react, not in accordance with a rigid rule, but in accordance with its more probable features. Such an environment, for instance, occurs in the experiment on the conditioned reflex ; the dog can react only to what will probably happen ; for it does not and cannot know what will in fact happen. The dog thus has to react not to the exact but to the statistical properties of its environment. Prof. Wiener has himself contributed to our knowledge of how such a system should behave if it is to act with maximal efficiency. The technique and methods developed for the statistical mechanics of predictors should here find a ready application.

In the proper adaptation of organism to environment, an important part is played by the organism's sensory equipment. I referred above to the fact that the main principles for *Gestalt*-recognition are now known. But it should not be overlooked that the formation of concepts at the abstract level has much in common with *Gestalt*-recognition at the sensory. Thus, not only can a "circle" be recognized in a variety of positions, sizes and colours, but "asymmetry" can be recognized in a variety of shapes ; and "equivalence" can be recognized in a variety of propositions. It is not impossible that these higher *Gestalt* recognitions may use physical mechanisms similar to those used at the sensory level. The possibility is at the moment under experimental investigation (Walter and Walter, 1949). The results can hardly fail to be of interest.

Not only the sensory but the motor apparatus can be studied by cybernetic methods ; for the motor cortex, in its attempts to control the limbs, has to overcome difficulties some of which have not been properly appreciated in the past by neurologists. Out of many possible examples one may be selected. Engineers who designed the helm and steering engine discovered, both practically and mathematically (MacColl, 1945) that the chain of controls cannot be made stable by a single feedback, but an extra feedback *must* be included at one or more intermediate states if the helmsman is to have effective

control of his ship. Exactly the same principle applies when the motor cortex tries to control the hand. For just as the helmsman exerts his control not directly but through successive mechanisms, each of which controls the next, so does the motor cortex exert its control through several joints—shoulder, elbow, wrist—each of which determines the position of the next. We can predict, therefore, that the motor control of the hand *must* have feedback at each stage; for in no other way can the arm be prevented from contorting at each attempted movement.

The nature of motor co-ordination will probably be much better understood when the new techniques have been more thoroughly applied. But even now it is clear that when, say, I stretch out my hand to grasp a pencil the mechanism at work must be arranged as in the diagram :



There is a circuit A with feedback. The higher centre acts so as to make the sub-system A goal-seeking for the state at which the distance between hand and pencil is zero. The activity in A is proportional to the "error," that is, to the amount by which the pencil is not yet reached, to the difference between the two representations of position in the sensory cortex. It will be noticed that the higher centre determines only the goal of the sub-system A: the details are left to be determined by A itself. The actual mechanism will, of course, be very much more complex; but its basic plan must be of this form; enough is known to-day to make this much certain.

Since the sub-system A is dynamic, it must be stable or it cannot function properly. Now it is a property of all dynamic systems, living or dead, that in changing from stable to unstable they tend to go through a stage of oscillation. Oscillation is a sign of approaching instability. (The reason is simple. The movement is compounded of terms like e^{at} , where t is the time and a a constant and complex. If a is negative, the motion diminishes and the system is stable. If a is positive, the motion increases without limit and the system is unstable. But if a is near zero, the imaginary part becomes appreciable and the quantity becomes e^{ibt} , where $i = \sqrt{-1}$, and this equals $\cos bt + i \sin bt$, which means that the motion is oscillatory.) We may therefore predict that if A is badly designed or diseased, it will, when brought into action, produce not the normal smooth movement, but an oscillation. The fact that tremor is common in disorders of movement is immediately intelligible in cybernetics, for exactly the same phenomenon, for exactly the same reasons, occurs in steering engines, in automatic searchlights, and in all similar mechanisms with feedback.

But these applications are distant from psychiatry. Are there any closer applications?

It must be confessed that the application of cybernetics to psychiatry lies rather in the future than the past. Nevertheless, there are certain relationships which may be of interest.

I mentioned earlier that the big computing machines, having some freedom and many memories, can get into peculiar states not to be cured by the simple replacement of a broken part or a blown tube. Faced with these complex and subtle disorders, the engineers sometimes sought the help of the psychiatrist, for they felt he might have some understanding of these peculiar, almost supra-mechanical disorders. The success of the advice given has not been recorded, but the engineers have worked out their own methods of treatment, and they will be briefly described.

A first method is simply to switch the whole machine off and start again. On their second run, many of the components will start from positions not the same as on their first: and some trifling coincidence which before led to trouble may not occur again. The withdrawal of the power means that any abnormal cyclical process will be stopped: and when the machine is re-started the parts may be swept into normal activity before they have time to re-establish their self-aggravating process. Whether this simple method of treatment bears any relation to that of sedation and continuous narcosis has yet to be discovered.

A second method is to switch out some abnormal part in the hope that what is left will be adequate for the task. If the task is simple and speed unimportant, a large proportion of the equipment can be removed without rendering the machine useless. The complete removal of the perniciously active part may enable the rest to act more efficiently. Whether such a sacrifice of the abnormal in order to use the normal portion is similar to the events at lobotomy is, of course, an open question.

Sometimes an engineer with a thorough practical and theoretical understanding of his machine may be able, when it develops an abnormality of function, to diagnose where in its depths the abnormal circuit must lie. Using his knowledge he may be able to throw in an exactly devised signal which he knows will be switched to precisely that abnormal circuit, and which will affect it in just the way he wants. His aim is to disrupt the abnormal circuit so that the parts can be linked into normal activities. Such a treatment can sometimes be achieved while the machine is actually engaged on its task. It demands, of course, an exact knowledge of the normal behaviour of the machine and an exact formation of the appropriate signal. Whether such a treatment can be compared to psychotherapy is, again, an open question.

The final method used by the engineers, essentially practical, and successful in a surprising proportion of cases, is to give the abnormal part of the machine a bang. A slightly defective contact, or an illegitimate contact due to dust, is often corrected and normal function restored. A similar method, often successful, is to use not a mechanical but an electrical shock; the whole machine is subjected to a brief but maximal electrical impulse. Since these large machines are mostly self-correcting, the direct effect of the electric shock is soon removed, but it is often found that after the shock the abnormal process has disappeared. In these machines the explanation can be given with some certainty. Most of their abnormal processes are due to the accidental occurrence of unstable states, of circuits which are regenerative and self-perpetuating. Such circuits are usually already operating at maximal intensity. A general increase in intensity does no harm to processes at *low* intensity, for they rise merely from low to medium. But those processes which are already at maximal intensity tend to be driven to a point at which some disruptive action occurs; and the circuit is thereby broken. *A general increase in intensity, therefore, tends selectively to disrupt those activities which are already maximal.* And these, as I said, are usually the pathological.

Professor Wiener's book touches on all these subjects and, being the first connected account, cannot fail to interest. But its quality varies from the good to the bad.

A virtue is its masterly treatment of the mathematical aspects of the subject. Nor is this surprising, coming from such an authority. It is well written and is, for a book of this type, easy to read. And it is enlivened by many acute observations.

But the book has faults which cannot be ignored. First, its misprints are excessive. For instance, p. 75 has five—enough to make the theorem unintelligible to those who do not already know it; p. 117 has another five; and MacColl's name is persistently misspelled. The reader is warned that no equation should be copied from the text until its freedom from misprint has been tested.

Another feature suggesting that the book was prepared hurriedly is its lack of balance. The chapter on the treatment of random disturbances is excessively detailed and technical. On the other hand, the chapter on control and communication in society, in spite of its rich possibilities of application in economic, in industrial, and in sociological systems, is so brief and superficial as to be negligible.

A final criticism carries a suggestion for improvement in a succeeding edition. Wiener's measure of the "amount of information" in a message or signal is not the same as Fisher's. He refers to Fisher's measure (on pp. 18, 76 and 109) only with dislike and irritation. These passages should be replaced by a more judicial and scientific discussion. Both the measures have proved their value, so there is no question of either being just wrong. A more comprehensive view, able to show both as aspects of one more fundamental entity, is needed.

But for all its faults the book is unique. It must be read.

W. ROSS ASHBY.

REFERENCES.

- ASHBY, W. ROSS (1940), *J. ment. Sci.*, **86**, 478.
Idem (1945), *J. gen. Psychol.*, **32**, 13.
Idem (1948), *Electron. Engin.*, **20**, 379.
 Conference on Teleological Mechanisms (1948), *Annals New York Acad. Sci.*, **50**, 187-278.
 JAMES, H. M., NICHOLS, N. B., and PHILLIPS, R. S. (1947), *Theory of Servo-mechanisms*. New York.
 MACCOLL, L. A. (1945), *Fundamental Theory of Servo-mechanisms*. New York.
 MAXWELL, J. CLERK (1868), *Proc. Roy. Soc. Lond.*, March 5.
 NYQUIST, H. (1932), *Bell System tech. J.*, **11**, 126.
 PITTS, W., and McCULLOCH, W. S. (1947), *Bull. math. Biophys.*, **9**, 127.
 ROSENBLUETH, A., WIENER, N., and BIGELOW, J. (1943), *Philosoph. Sci.*, **10**, 18.
 ROUTH, E. J. (1905), *Advanced Rigid Dynamics*. London. 6th ed.
 WALTER, V. J., and WALTER, W. GREY (1949), *EEG Clin. Neurophysiol.*, **1**, 57.

Part III.—Bibliography and Epitome.*

ACTA PSYCHIAT. NEUROL.

VOL. XXIII.	1948.
*Investigation into the Reflexes during the Post-convulsive Stage of Metrazol and E.C.T. Seizures. <i>Broman, T.</i>	183
*The Histopathological Reaction of the Area Postrema. <i>Cammermeyer, J., and Adams, R. D.</i>	205
Blood-Brain Barrier in Concussion. <i>Engel, D.</i>	231
Histamine and Antihistamine Treatment of Headache. <i>Esmarch, O.</i>	235
*The Action of Hydrogen Peroxide on the Undamaged Brain Surface. <i>Givré, A., and Bror Rexed</i>	247
Intravenous Insulin as a Method to Produce Abnormal EEGs. in Epileptics. <i>Hertz, H., and Wulff, M. H.</i>	257
*Mental Symptoms in Association with Pituitary-Hypothalamus Lesions. <i>Pedersen, A. L.</i>	261
A Case of Guillain-Barré's Syndrome following Vaccination against Smallpox. <i>Lindqvist, T., and Stenström, N-M.</i>	279
Periodical Depression as an Independent Nosological Entity. <i>Pedersen, A., et al.</i>	285
Abacterial Meningo-encephalitis with Increased Protein Content of C.S.F. <i>Trier, M.</i>	329
An Examination of the Accuracy of Izikowitz's Method for the Determination of Total Protein and of Globulin in the C.S.F. <i>Trolle, C.</i>	347
On the Differentiation of Some Typical Forms of Hypnagogic Hallucinations. <i>Vihvelin, H.</i>	359

Investigations into the Reflexes during the Post-convulsive Stage of Metrazol and Electro-shock Seizures.

The purpose of the present investigations was to study the reflexes during the post-paroxysmal state in metrazol and electro-shock seizures. The material was supplemented by a few cases of "spontaneous" epileptic fits. In some of the cases an electromyographic registration of the events during the seizure and the post-paroxysmal state was made.

Generally, three phases of the post-paroxysmal state could be discerned. During the first phase there was a total extero-ceptive areflexia with a persistence of the most simple reactions only, the breathing movements and the two-neuron-reflexes. The last reflexes (the muscle reflexes) were—as stated by Kino and Kalinowsky *et al.*—exaggerated in most cases during the first phase. In most cases, however, this exaggeration did not appear immediately after the cessation of the convulsions, but after a lapse of about 2 seconds. It is discussed whether this exaggeration was due to a subliminal after-activity in the spinal tracts. In a few cases of metrazol-shock seizures there appeared a continuous activity during the intervals between the convulsions as well as immediately after the cessation of the convulsions. This phenomenon pointed to a persistent action of the drug and to differences in the effect on different regions of the central nervous system. This early form of continuous activity was associated with exaggerated muscle reflexes as opposed to the later spontaneous activity during the second phase of the post-paroxysmal stage. In this phase the subject starts to react to nociceptive stimuli and the first exteroceptive reflexes are seen (first the corneal reflex, then the pupillary light reflex, then the pupillary reflex and later the Babinski reflex), while the exaggeration of the muscle reflexes wanes until the reflexes are of normal briskness. Thus, the

* A number of abstracts in this section are reproduced from *Chemical Abstracts* and *Psychological Abstracts*. To the Editors of these two Journals we extend our grateful thanks.

positive Babinski reflex (demonstrable in about 75 per cent. of the cases) and the exaggeration of the muscle reflexes are dissociated phenomena. During the third phase—from about 5 to about 10 minutes after the cessation of the convulsion—the normal skin reflexes reappear, and the subject, still in a state of confusion, begins to react to verbal stimuli. (Author's abstr.)

The Histopathological Reaction of the Area Postrema.

In general the pathological reactions in the areae postremae are similar to those in the leptomeninges and are quite unlike those which occur in other parts of the nervous system. This is partly to be accounted for by the proximity of these areae to the meninges and the apparent communication along rather wide Virchow-Robin spaces with the subarachnoid space. Other important factors may be the looseness of the tissue, permeability of the blood vessels, and peculiarities in tissue structure. The present study supports the idea that this distinctive anatomical region of the nervous system, whose biological significance is as yet unknown, maintains its unique character in ageing processes and in its reactions to a variety of different diseases. (Authors' abstr.)

The Action of Hydrogen Peroxide on the Undamaged Brain Surface.

The effect of solutions of hydrogen peroxide of varying concentration on the cat's brain was investigated. A 10 per cent. solution caused an intense vasodilatation of the pia, probably extending into the depth of the cortex, with markedly increased permeability to trypan-blue. The nerve cells of the superficial cortical layers showed signs of acute injury. A 5 per cent. solution had the same effect, though in a less degree. A 3 per cent. solution caused only changes which in all probability are passing. It is recommended to use hydrogen peroxide solutions not stronger than 3 per cent. for hemostatic purposes in neurosurgery. (Authors' abstr.)

Mental Symptoms in Association with Pituitary-Hypothalamus Lesions.

A rather uniform emotional syndrome seems to have been ascertained on the basis of a number of case histories, partly for patients with pituitary lesions (Group I), and partly for patients with a well-characterized lesion, no doubt of hypothalamic origin (Group II). This syndrome is characterized particularly by emotional instability and egocentricity, symptoms which often cause these patients to be called "hysterical." Although these are frequent mental symptoms which cannot be said to constitute a characteristic mental picture, they are by no means reminiscent of the preoccupation with themselves and their disease so common among neurotics and patients with diseases running a protracted course. The present series of patients had clinically well-characterized brain lesions and the mental symptoms are supposed to have been due in both groups to affection of the vegetative (hormonal?) centres in the hypothalamus. A third group of patients, who undoubtedly likewise had or had had an organic brain lesion, presented, after the occurrence of the organic lesion, typically "hysterical" symptoms, suggesting a lesion in the hypothalamus also in these patients.

The material thus bears out the theory of the great importance of the hypothalamus for emotional disturbances and hysterical reactions. Accordingly it will be expedient in such cases also to look for signs of disturbance in the more "somatic" functions of the hypothalamus, among others, fat and carbohydrate metabolism, sexual function and blood pressure. (Author's abstr.)

ACTA. PSYCHIAT. NEUROL., SUPPT.

Electromyo-mechanographic Registrations of Passive Movements in Normal and Pathological Subjects. *Broman, T.* 1949. liii

AM. IM.

VOL. V. 1948.
The Beans of St. Botolph's, etc. *Wells, F. L.* 38
Totem Feast in Modern Dress. *Tarachow, S.* 65
The Bear in the Haunted Mill. *Roheim, G.* 70

AM. J. ORTHOPSYCHIAT.

VOL. XIX.	JANUARY, 1949.
Training for Psychotherapy, with Special Reference to Non-medical Fields: Symposium	I
Group Therapy—Round Table	56
Emotional Implications of Rheumatic Heart Disease in Children. <i>Josselyn, I. M.</i>	87
Projective Features of Contemplative Artistic Experience. <i>Lee, H. B.</i>	101
Organic Impairment Simulating Mental Deficiency. <i>Fay, T., and Doll, E. A.</i>	112
Mental Deficiency from the Viewpoint of the Obstetrician. <i>Murphy, D. P.</i>	120
Development of Social Competencies in Adolescents Originally Classified as Feeble-minded. <i>Schmidt, B. G.</i>	125
Adaptation of the Psychoanalytic Technique for the Treatment of Young Children with Atypical Development. <i>Rank, B.</i>	130
Projective Technique in Clinical Practice. <i>Levy, D. M.</i>	140

AM. J. PSYCHIAT.

VOL. CV.	JANUARY, 1949.
Extramural Medical Care and the National Resources. <i>Hawley, P. R.</i>	481
Public Mental Hospitals in England. <i>Pratt, D.</i>	485
Patient Population Distribution in Mental Hospitals in the United States. <i>Liebman, S., and French, R. L.</i>	489
Prophylactic Electroshock. <i>Geoghegan, J. J., and Stevenson, G. H.</i>	494
Review of Psychiatric Progress, 1948	497

FEBRUARY.

Current Developments and Problems in Military Neuro-psychiatry. <i>Caldwell, J. M., jun.</i>	561
The Involutional Psychoses. <i>Malamud, W., et al.</i>	567
*Comparative Lymphocytic and Biochemical Responses of Patients with Schizophrenia and Affective Disorders to ECT, Insulin and Epinephrine. <i>Parsons, E. H., et al.</i>	573
Psychosurgery. <i>Freeman, W.</i>	581
The Influence of ECT on Blood Sugar, Total Number of Leucocytes and Lymphocytes. <i>Stern, K., et al.</i>	585
New Possibilities in Private Psychiatric Practice. <i>Oberndorf, C. P.</i>	589
The Insanity Plea in Crime. <i>Rymer, C. A.</i>	594
Some Aspects of Concentration Camp Psychology. <i>Friedman, P.</i>	601
The Evaluation of a Psychiatric Examination. <i>Diethelm, O.</i>	606
Psychological Significance of Physical Restraint to Mental Patients. <i>Erickson, M. A.</i>	612
The Clinical Importance of Some Normal Aptitudinal and Ideological Transitions of Mid-life. <i>Billings, E. G.</i>	615
A Sociopsychiatric Study of Twenty-five Young Offenders. <i>Adelson, E. T., et al.</i>	619
Hypnosis in ECT. <i>Maholick, L. T., and Warkentin, J.</i>	623 ^a

Comparative Lymphocytic and Biochemical Responses of Patients with Schizophrenia and Affective Disorders to Electroshock, Insulin Shock and Epinephrine.

The effect of epinephrine on the circulating white blood cells in normal and psychotic (schizophrenic and manic-depressive) subjects are shown to be similar and approximate the effects obtained on psychotic subjects after electroshock treatment. Insulin also produced a lymphocytopenia but changes occurred more slowly and were of longer duration.

Investigation of plasma proteins and hemoglobin showed no significant differences in changes following epinephrine injection. After electroshock there was an immediate increase in serum proteins and hemoglobin with a return to pre-shock amounts in $\frac{1}{2}$ to 1 hour. The lymphocytopenia occurred later and could not therefore be accounted for by hemodilution.

It is concluded that the circulating lymphocytes in psychotic subjects respond to epinephrine in the same way as do the controls. Furthermore, electroshock and insulin coma produce a lymphocyte response similar to that following epinephrine. These data do not support the contention that there is a disorder of pituitary-adrenal function in psychotic patients. On the other hand, apparently stressful psychologic disturbances in psychotic patients are not accompanied by lymphocytopenia or hyperglycemia. In this respect they differ from normal subjects. It is suggested, therefore, that there is a defect in psychotic patients which obstructs communication between the central nervous system and the endocrine system. (Authors' abstr.)

MARCH.

A Study of Selective Service Law Violators. <i>Pescor, M. J.</i>	641
The Role of Rhythmic Patterns in Childhood. <i>Lourie, R. S.</i>	653
*The Effect of Glutamic Acid Upon the Mental and Physical Growth of Mongols. <i>Zimmerman, F. T., et al.</i>	661
Mental Hospital Employees. <i>Bonner, C. A.</i>	669
*The Carotid Sinus in Neuropsychiatric Cases. <i>Greenblatt, M., et al.</i>	673
Carbon-dioxide Narcosis Therapy. <i>Kindwall, J. A.</i>	682
The Use of Malononitrile in the Treatment of Mental Illnesses. <i>MacKinnon, I. H., et al.</i>	686
Current Trends in German Psychiatry. <i>Schneider, K.</i>	689
A Note on the Architecture of the Psychiatric Ward. <i>Merrill, B.</i>	691
Facilitation and Inhibition as Factors in Behavioral Deviations. <i>Cameron, D. E.</i>	693
Psychosexual Factors in the Paranoid Phenomena. <i>Klein, H. R., and Horwitz, W. A.</i>	697

The Effect of Glutamic Acid Upon the Mental and Physical Growth of Mongols.

1. Glutamic acid accelerates both mental and physical growth in Mongols.
 2. Improvement in mental growth, while genuine, is not as great as in non-mongoloid retardation.
 3. Improvement in physical growth, however, is striking over a 6 months' treatment period.
- (Authors' Abstr.)

The Carotid Sinus in Neuropsychiatric Cases.

The electroencephalographic, electrocardiographic and clinical effects of carotid sinus stimulation, unilaterally and bilaterally, were studied in 122 individuals.

In every case in whom satisfactory carotid sinus compression was performed, cardiac slowing or asystole was obtained immediately. One-fourth of the cases showed asystoles, usually 3-5 seconds in duration but varying up to 9 seconds.

In 66 per cent. of the cases high voltage 3 per second slow waves appeared abruptly in the EEG diffusely and symmetrically, after 10 seconds of sustained forceful compression of the carotid sinuses.

In 60 per cent. of the cases unconsciousness with a short tonic-clonic seizure occurred immediately after the appearance of the slow-wave discharge. The seizure lasted 5-15 seconds, with recovery immediate and complete.

These effects of compression could be repeated many times with remarkable consistency without any cumulative or permanent effects upon the EEG or EKG.

Compression of the common carotid arteries below the bifurcation produced immediate acceleration of the heart. The central effects were obtained after approximately 10 seconds of sustained compression and were similar to those obtained by carotid sinus compression.

Elevation of blood pressure reduces the central effect of carotid sinus compression. Electric shock and prefrontal lobotomy facilitate the central effect of carotid sinus compression.

The central effects of carotid sinus compression described above are thought to be due largely to interference with the carotid circulation to the brain.

(Authors' Abstr.)

APRIL.

The Role of Medical Administration in Psychiatric Hospital Treatment.	
<i>Russell, W. L.</i>	721
*Transorbital Lobotomy. <i>Freeman, W.</i>	734
A New Instrument for Performing Transorbital Leukotomy. <i>Moore, M. T.</i>	741
*Frontal Lobotomy. <i>Oltman, J. E., et al.</i>	742
*The Effects of Prefrontal Lobotomy on the Symptomatology of Schizophrenic Patients. <i>Rothschild, D., and Kaye, A.</i>	752
A Rating Scale Analysis of the Clinical Effects of Lobotomy. <i>Sands, S. L., and Malamud, W.</i>	760
A Current Evaluation of the Anticonvulsant Drugs. <i>De Jong, R. N.</i>	767
The Practice of Psychiatry in a Rural Community. <i>Sirkin, J.</i>	775
Reactions of Children to a Highly Publicized Crime Against a Child. <i>Sloman, S. S.</i>	779
Psychiatric Facilities in Montreal and Quebec. <i>Legrand, E., and Reed, G. E.</i>	782

Transorbital Lobotomy.

Transorbital lobotomy accomplishes much the same effect as topectomy of Areas 9 and 10, in that it abates the psychosis without producing any undesirable personality changes.

Transorbital lobotomy is simple, quick and safe. It is recommended particularly for psychiatrists in mental hospitals where major neurosurgical procedures are not available.

Transorbital lobotomy under electroconvulsive shock should be undertaken when active therapy fails or is about to be replaced by "maintenance therapy." It should be definitely understood, however, that the procedure is a minor one and that some cases may later require major lobotomy for permanent relief.

(Authors' Abst.)

Frontal Lobotomy.

Since May, 1946, 107 patients have undergone frontal lobotomy at the Fairfield State Hospital. The group was composed almost entirely of individuals suffering from chronic mental illness whose prognosis seemed extremely unfavorable; 85 per cent. were schizophrenics. The average duration of mental illness was 7.4 years and of hospitalization, 4.4 years prior to operation. The results following lobotomy have been encouraging: 56.7 per cent. of the entire group exhibited significant improvement; thus far, 37.4 per cent. have been able to leave the hospital. The mortality rate was low, and complications, except for convulsive seizures, have been relatively infrequent. Prognostic guides seem to consist chiefly of the type of illness and the character of symptomatology. Results were best in the non-schizophrenic group, next best in the paranoid catatonic, and mixed types of schizophrenia, and poorest in simple and hebephrenic dementia praecox. Disturbed, aggressive, combative and hostile patients appeared to receive maximum benefit. Duration of illness had relatively little significance as a prognostic guide. Lobotomy may be especially helpful in patients suffering from pulmonary tuberculosis, which is a specific contraindication to shock therapy. There is no reduction of intellectual functioning following operation; patients who could be tested exhibited an average rise of 10 points on the Wechsler-Bellevue scale 6 months postoperatively. Lobotomy appears to be a fruitful method in the treatment of chronic mental disease.

(Authors' abstr.)

The Effects of Prefrontal Lobotomy on the Symptomatology of Schizophrenic Patients.

The clinical results of prefrontal lobotomy were studied in 100 cases of schizophrenia. Ten patients were much improved, 32 were improved, 42 were slightly improved, 14 were unimproved and 2 were worse. While the figures were more favourable in cases of less than 5 years' duration, worth-while improvement was obtained with considerable frequency in patients who had been ill for periods up to, and even beyond, 20 years.

In order to determine what the foregoing results mean in terms of individual mental functions, various symptoms were studied before and after lobotomy.

According to these observations, lobotomy leads to amelioration of some of the secondary or less important symptoms ; it renders the patients more susceptible to external stimuli, so that they are less able to isolate themselves from the environment ; and it reduces certain active reactions to more passive ones, thereby making the patients more tractable. However, prefrontal lobotomy apparently fails to produce any noteworthy improvement of the psychopathologic disturbances which are most important in schizophrenic disorders.

In view of these observations the opinion is expressed that the selection of schizophrenic cases for treatment by lobotomy should be confined largely to patients who have been ill for 4 or 5 years or longer. (Authors' abstr.)

AM. J. PSYCHOTHER.

VOL. III.

JANUARY, 1949.

Criteria for Early Differential Diagnosis of Psychoneurosis and Schizophrenia.

<i>Lewis, N. D. C.</i>	4
A Peculiar Intermediary State Between Waking and Sleeping. <i>Froeschels, E.</i>	19
The Use of Fiction in Psychotherapy. <i>Lazarsfeld, S.</i>	26
The Use of the Rorschach Test in an Outpatient Clinic. <i>Zucker, L.</i>	34
Autobiography (VIII). <i>Stekel, W.</i>	46

AM. PRACTIT.

VOL. III.

1949.

Infectious Polyneuritis. <i>Stearns, N. S.</i>	325
Advances in Treatment in Neurologic Diseases. <i>Silverstein, A.</i>	344
Metastatic Tumors of the CNS. <i>Wilson, G., and Rupp, C.</i>	350
The Nature and Functions of Emotions. <i>Tyler, S. H.</i>	368
A Critique of the Physiologic Methods in Psychiatric Therapy. <i>Branch, C. H. H., and Smith, L. H.</i>	460

AM. PSYCHOL.

VOL. III.

1948.

Reduction in General Intelligence Following Frontal Gyrectomy and Frontal Lobotomy in Mental Patients. *Malmo, R. B.*

277

ANN. MÉD.-PSYCHOL.

VOL. CVI.

DECEMBER, 1948.

Psychiatric Criticism and Existentialism. <i>Duss, L.</i>	553
Treatment of Serious Emergencies during Insulin Coma. <i>Porot, M.</i>	596

VOL. CVII.

JANUARY, 1949.

Clinical Examination in Medicine and Psychiatry. <i>Guiraud, P., and Caloutsis, A.</i>	I
Perceptive Elaboration in States of Mental Dissociation. <i>Burstin, J.</i>	21

APPL. PSYCHOL. MONOGR.

1948.

The Selection and Use of Diagnostic Categories in Clinical Counseling. *Pepinsky, H. B.*

No. 15

ARQ. ASSIST. PSICOPAT., SAO PAULO.

VOL. XII.

1947.

Contribution Towards Psychiatric Semeiology: Pneumoencephalography. <i>Silveira, A., et al.</i>	5
Contribution Towards the Statistical Study of General Paralysis. <i>Filho, C. A., and Cardoso, W.</i>	103
The Importance of History-taking in Psychiatric Diagnosis and Prognosis. <i>Mira y Lopez, E.</i>	195

A Transitory Cerebellar Picture after Pneumoencephalography. <i>Robortella, M., and Pereira da Silva, C.</i>	209
Some Verified Endocrine Aspects of Oligophrenia. <i>Kryniski, S.</i>	219
Syndrome of the Sphenoidal Sinus of Traumatic Origin. <i>Cintra, T. L. P., et al.</i>	229
Electroshock Treatment. <i>Yahn, M., and de Barros, P. F.</i>	233

ARCH. NEUR. PSYCHIAT.

VOL. LIX.

JUNE, 1948.

*Activation of Seizures and EEG Disturbances in Epileptic and in Control Subjects with "Metrazol." <i>Cure, C., et al.</i>	691
*Role of Afferent Impulses in Experimental Convulsions. <i>Gellhorn, E., and Ballin, H. M.</i>	718
Winking-Jaw Phenomenon. <i>Warterburg, R.</i>	734
Responses to Thermal Stimuli Mediated Through the Isolated Spinal Cord. <i>Macht, M. B., and Kuhn, R. A.</i>	754
Trypan Red Therapy of Amyotrophic Lateral Sclerosis. <i>Aird, R. B.</i>	779

NEW YORK NEUROLOGICAL SOCIETY.

Pain Disturbances Associated with Certain War Wounds. <i>Pool, J. L.</i>	810
Disturbances of the Nervous System due to Anoxia and Related Factors in Flying Personnel. <i>Klingman, W. O.</i>	813
Nutritional Disorders in Allied Repatriates and Japanese Prisoners of War. <i>Everts, W. H.</i>	817

PHILADELPHIA NEUROLOGICAL SOCIETY.

Pneumoencephalographic Diagnosis of the Presenile Dementias. <i>Chodoff, P., and Freeman, W.</i>	823
Intramedullary Granuloma of the Spinal Cord. <i>Larney, M. M.</i>	826
Neurinoma of the Twelfth Cranial Nerve. <i>Scott, M., and Wycis, H. T.</i>	828
Choreoathetotic Syndrome Following Fracture. <i>Silverstein, A.</i>	829
Studies in Cerebral Concussion. Various	835

CHICAGO NEUROLOGICAL SOCIETY.

Hemiballismus. <i>Luhan, J. A.</i>	838
Postherpetic Argyll Robertson Pupil. <i>Luhan, J. A.</i>	839
Lead Encephalomyotrophy. <i>Arief, A. J., and Schiller, M. A.</i>	839
Dural Abscess. <i>Arief, A. J., and Brown, A.</i>	841
Arsenical Polyneuritis. <i>Garner, H.</i>	842
Recurrent Subarachnoid Hemorrhages. <i>Haase, E.</i>	842
Myotonic Dystrophy. <i>Sherman, I. C., and Tigay, E.</i>	843
Crossed Cerebral Lesions. <i>Victor, S. A.</i>	843
Thrombosis of the Anterior Spinal Artery. <i>Sherman, I. C.</i>	844

Activation of Seizures and Electroencephalographic Disturbances in Epileptic and in Control Subjects with "Metrazol."

Electroencephalographic and clinical responses to "metrazol" were studied in 132 epileptic patients and in 42 non-epileptic, control subjects in the attempt to develop a method for the activation of epileptic discharge for diagnostic purposes. Three modes of administration of "metrazol" were studied in separate groups of patients: rapid intravenous injection, intramuscular injection and slow intravenous injection of a 2 per cent. solution at the rate of 20 mg. each half-minute. Monkeys with experimentally produced focal epileptogenic lesions were also studied.

The method of rapid intravenous injection of small doses of the 10 per cent. solution was discarded because of the abrupt onset of its convulsant action, making observations on the form of onset of the epileptic pattern difficult, and because of the difficulty in regulating the optimum dose required. Some generalized "metrazol seizures" were obtained in epileptic patients whose habitual attacks were of focal onset.

Intramuscular injection of a 10 per cent. solution was more satisfactory as a method for the activation of the patient's habitual pattern of electroencephalographic disturbance and form of clinical seizure, but the injections were painful and the dosage was difficult to assess and to control.

The slow intravenous injection of the dilute solution was not painful, produced a gradual activation of epileptiform disturbance in the electroencephalogram and often induced the aura or onset of the patient's habitual clinical seizure, at which time the injection could be stopped (and phenobarbital administered) before a severe generalized attack occurred. Major seizures did occur, however, in a few patients. The principal results may be summarized as follows.

1. Epileptiform discharge was increased or induced in the electroencephalogram of 80 per cent. of the epileptic patients studied with the slow intravenous method. A clinical response revealing the nature of the onset of the patient's spontaneous attacks occurred in 56 per cent. of these patients.

2. An epileptiform seizure occurred in only 1 (3 per cent.) of the non-epileptic (control) subjects given the maximum dose of 400 mg. of "metrazol" in the same manner. Paroxysmal 4 to 6 per second, bilaterally synchronous slow wave disturbances occurred in the electroencephalograms of 26 per cent of the control subjects. There was some evidence that this response indicated a low convulsive threshold, but the effect was considered non-specific with regard to the diagnosis of clinical epilepsy.

3. Susceptibility to "metrazol" seemed related to the patient's convulsive threshold, since it was decreased in patients with infrequent seizures and in those receiving anticonvulsant medication at the time of the examination. Patients over 40 years of age seemed less susceptible.

4. Patients with idiopathic epilepsy, especially with a bilaterally synchronous wave and spike electroencephalographic pattern, were most sensitive to "metrazol." Patients with bilaterally synchronous electroencephalographic disturbances were more sensitive than those with superficial focal epileptogenic lesions of the cortex.

5. "Metrazol" slowly administered in small doses served to activate experimentally produced focal epileptogenic lesions of the cortex in monkeys and to induce seizures of focal motor onset.

6. The slow intravenous injection of dilute solutions of "metrazol" has definite advantages over other methods now available for the induction of seizures in epileptic patients. When used in conjunction with the electroencephalograph, it makes possible a clear diagnosis in many cases in which the nature of the seizures has previously been obscure.

(Authors' abstr.)

Role of Afferent Impulses in Experimental Convulsions.

The influence of afferent impulses on convulsive movements and on cortical and hypothalamic potentials was studied. The afferent impulses were induced by mechanical or electrical stimulation of the sciatic nerve or by electrical stimulation of the sciatic nerve or by electrical stimulation of the posterior portion of the hypothalamus. Observations were made at various degrees of picrotoxin poisoning. The following results were obtained on cats anesthetized with "dial."

With adequate degrees of picrotoxinization, stimulation of either the sciatic nerve or the hypothalamus induced convulsions for various periods during and after stimulation. Ligation of the sciatic nerve seemed to be the most effective procedure. If slight convulsions existed prior to the stimulation, afferent stimuli might greatly aggravate these convulsions.

If convulsions were precipitated or intensified as the result of afferent stimuli, the cortical potentials increased in amplitude and frequency. In a number of observations large, frequent spike potentials, resembling those seen in cases of status epilepticus, occurred.

The study of cortical and hypothalamic potentials under the influence of hypothalamic and sciatic stimulation in picrotoxinized animals revealed that hypothalamic and cortical "convulsive" activity may be dissociated. It is concluded that, although afferent impulses originating in the hypothalamus may initiate or intensify convulsions, the hypothalamus does not seem to determine the rate of cortical "convulsive" activity in these experiments.

It appears that the motor area is not particularly sensitive to picrotoxin, since sensory and suppressor areas may show larger and more frequent spikes. Consequently, severe "convulsive" discharges may be precipitated in non-motor areas of the cortex as a result of afferent stimuli in the absence of overt convulsive movements.

The study of cortical potentials in cats subjected to intravenous injections of picrotoxin or to local strychninization shows that an increase, as well as a decrease, in "convulsive" activity may result from afferent stimuli. Other conditions being equal, the former effect is due to strong, and the latter to weak, stimuli. Intensification of "convulsive" potentials seems to be associated with increased recruitment and decreased synchronization, whereas suppression of convulsive potentials is accompanied with decreased synchronization only. On cessation of stimulation, increased "convulsive" discharges (rebound) may follow suppression of "convulsive" potentials during stimulation.

Quantitative differences in the convulsive reactivity of different cortical areas account for the fact that an afferent stimulus may increase "convulsive" potentials in one area and decrease them in another. (Authors' abstr.)

VOL. LX.

JULY.

Electrodiagnosis of Lesions of Peripheral Nerves in Man. <i>Pollock, L. J., et al.</i>	I
Calcifying Epileptogenic Lesions. <i>Penfield, W., and Ward, A.</i>	20
*Manic-Depressive Psychosis. <i>Huston, P. E., and Locher, L. M.</i>	37
Spinal Subdural Abscess. <i>Freedman, H., and Alpers, B. J.</i>	49
*Ergotamine Tartrate in Treatment of Combat Exhaustion. <i>Lemkau, P. V., and Sampliner, R. B.</i>	61
"Pentothal Sodium" as an Adjunct in Therapy of Anxiety Hysteria. <i>Rosenbaum, M.</i>	70
Intramuscular Use of Tubocurarine in Chronic Spasticity due to Disease of the CNS. <i>Nathanson, M., et al.</i>	77
Aneurysm of Terminal Portion of Anterior Cerebral Artery. <i>Sugar, O., and Tinsley, M.</i>	81
Unilateral Frontal Anhidrosis and Miosis Occurring after Petrous Apicectomy. <i>Simonton, K. M., and Gay, J. R.</i>	86

CHICAGO NEUROLOGICAL SOCIETY.

Peculiar Low Temporal Localization of Sleep. <i>Gibbs, E. L., et al.</i>	95
Prefrontal Lobotomy. <i>Freeman, W., and Watts, J. W.</i>	97
Mechanics of Gunshot Injury to the Spinal Cord. <i>Brookhart, J. M.</i>	100

NEW YORK ACADEMY OF MEDICINE, SECTION OF NEUROLOGY AND PSYCHIATRY.

Cerebral Injuries due to Explosion Waves: "Blast Concussion." <i>Cramer, F., et al.</i>	101
A Specific Epileptic Syndrome Treated by Lysis of Pacchionian Granulations. <i>Scarff, J. E.</i>	103

Manic-Depressive Psychosis: Course when Treated and Untreated with Electric Shock.

Two groups of patients with a diagnosis of manic-depressive psychosis are compared: a control group of 80, and a group of 74 treated with electric shock. These groups were comparable with respect to age of onset of the depression for which the patient was admitted; duration of illness before admission; percentage of typical depressions, number of depressions per patient; duration of pre-admission depressions; age (decade) of onset for all the depressions the patients had had; distribution of single and multiple depressions, and racial, cultural and economic factors. The control group was followed up to fourteen years after discharge, the median period being seven years, and the shock group was followed up to four years, with a median period of three years.

In the control group, at the end of the follow-up period for the admission depression, 63 patients, or 79 per cent, had recovered spontaneously; 6, or 7 per cent., had committed suicide; 4, or 5 per cent., had died of causes other than suicide, and 7, or 9 per cent., were still depressed. Five of the 6 suicides occurred within 14 months after the patient's discharge. In 2 of the 4 deaths the mental illness was an important contributing cause. The patients who were still depressed had been transferred to state psychiatric hospitals, where they continued to reside, from 76 to 117 months later.

In the shock group, at the end of the follow-up period for the admission depression, 65 patients, or 88 per cent., showed complete recovery; 1, or 1 per cent., had committed suicide; 1, or 1 per cent., had died of causes other than suicide, and 7, or 10 per cent., were still depressed. The suicide occurred 42 months after discharge, and the cause of the death was unrelated to the mental illness. The patients who were still depressed had been discharged 24 to 48 months previously and had lived continuously outside institutions for patients with mental disease.

The median duration of depression for the 63 patients in the control group who recovered spontaneously was 15 months, and that for the 65 patients of the shock group who showed complete recovery was 9 months. Hence, shock therapy shortened the duration of the depression by 6 months. This saving would have been increased if the treatment had been given earlier, since the median duration of depression prior to admission was 4 months.

Evidence was introduced to show that shock therapy does not prevent subsequent depressions, nor does it predispose to subsequent depressions.

An analysis was made of factors frequently mentioned as related to the course of depressions. This analysis included family history, premorbid personality, age of onset, acuteness of onset, type of onset, severity of symptoms, typicality of psychosis, duration of illness before treatment, number of previous depressions, number of shocks and sex of patient. In the control group, there was a definite increase in duration of the depression with advancing age of onset and with severity of symptoms. The length of a depression could not be predicted in any given case from knowledge of the length of previous depressions. There was a suggestion that depressions with psychogenic onset lasted longer than depressions with endogenous onset, and that atypical depressions were longer than typical depressions. Family history, prepsychotic personality, acuteness of onset, number of previous depressions and sex of the patient had no relation to the outcome or duration of the admission depression. No factor was isolated which was associated with depressions of long duration. In the shock group, none of the aforementioned factors had a significant relation to the results of shock, though there was some evidence that atypical depressions responded better than typical ones, and first depressions better than second or third depressions. No factor was found to be associated with depressions which failed to respond to shock or with subsequent depressions. The factors associated with the response to shock are therefore unknown.

It is concluded that electric shock therapy is indicated in the treatment of manic-depressive psychosis (depressive type, mixed type, perplexed type and type with paranoid features). The basis of this conclusion is that shock therapy produces a rate of recovery as high as that of spontaneous recovery, reduces the incidence of suicide, probably prevents deaths and shortens the duration of depressions. It should be emphasized that the length of a depression cannot be predicted in a given case and that some depressions, particularly in older patients, may be very long—the longest in the authors' series being 10 years.

(Authors' abstr.)

Ergotamine Tartrate in Treatment of Combat Exhaustion.

In a controlled series of matched patients, ergotamine tartrate appeared to be more effective in relieving the symptoms of combat exhaustion than good ward management and group psychotherapy alone.

The subjective sense of tension and the tremor were the symptoms most strikingly relieved by ergotamine tartrate.

Pain in the legs, particularly a sense of tightness of the adductors of the thigh, was a common, but not serious, complication of treatment with ergotamine tartrate.

In contrast with the observations of another investigator, no evidence of circulatory disturbance of the extremities was noted.

One patient had an attack of syncope, with a pulse rate of 38 a minute, but in this case there was a history of previous syncopal attacks. It is concluded that "sodium amytal" is required in much smaller doses in narcosis therapy when combined with ergotamine tartrate. Excitements are less of a problem in patients treated with the two drugs in combination than in patients treated with "sodium amytal" alone.

It is suggested that ergotamine tartrate may exert a central influence on the reflexes concerned in the control of tremor and tonus in the voluntary musculature. (Authors' abstr.)

AUGUST.

Classification of the Epilepsies. Penfield, W.	107
*Relation of "Thinking" and Language. Myers, R.	119
Activation of Human Nerves by Ischemia. Kugelberg, E.	140
Activation of Human Nerves by Hyperventilation and Hypocalcemia. Kugelberg, E.	153
*Cerebral Vascular Lesions. Cohn, R., et al.	165
Hemorrhagic Lesions in the CNS in Acute Poliomyelitis. Lev, M., et al.	182

BOSTON SOCIETY OF PSYCHIATRY AND NEUROLOGY.

Clinical Studies on Fatigue States. Shands, H. C., et al.	210
Dyslesia. Jossmann, P. B.	215
Physiologic Studies in ECT. Altschule, M. D., and Tillotson, K. J.	217

Relation of "Thinking" and Language: An Experimental Approach, Using Dysphasic Patients.

A method is described whereby the language-thought problem may be attacked experimentally. The degree of receptive disorder was approximated in 18 dysphasic patients by a test administered in a standardized manner. Each patient was then matched with a "normal" hospitalized patient in respect to age, sex, colour, formal schooling, social and economic status, original language and intelligence quotient. It was further possible in the case of 5 of the dysphasic patients to match them with non-dysphasic patients having a lesion in the "subordinate" hemisphere. The ability of the dysphasic and the non-dysphasic patients to discover solutions to "non-verbal" problems of graded difficulty was then measured by the use of a multiple choice apparatus. The prime object in each problem posed was to learn as quickly as possible how to extinguish a light by selecting a crucial key bearing specific positional and colour relations to neighbouring keys.

The ready accessibility of language cues in nondysphasic persons might be expected, in terms of behaviouristic, *Gestalt* and certain other theories, to afford their thinking processes an appreciable advantage over those of dysphasic persons. However, for the particular tests used here, no significant differences were demonstrable between the scores made by the experimental and the control groups. Generalizations based on the data thus far obtained do not appear warrantable.

The method described is susceptible of indefinite elaboration as regards the difficulty of the problems posed. (Author's abstr.)

Cerebral Vascular Lesions: Electroencephalographic and Neuropathologic Correlations.

1. Subarachnoid hemorrhage primarily induces minimal or moderate generalized abnormal electroencephalographic changes. Occasionally focal decreased electric output is also observed.
2. Subdural hemorrhage, in the main, acts as an intracranial space-consuming lesion.
3. Relatively superficial lesions (thromboses or hemorrhages) give rise to prominent focal slow wave activity.
4. Deep subcortical lesions give rise to little focal or general low frequency activity.
5. Patients with arterial hypertension show progressive electroencephalographic changes with continuing chronicity.

(Author's abstr.)

SEPTEMBER.

- *Changes in Brain Structure and Memory after Intermittent Exposure to Simulated Altitude of 30,000 feet. *Jensen, A. V., et al.* . . . 221
- *Dynamic Anatomy of the Cerebral Circulation. *Shenkin, H. A., et al.* . . . 240
- *Studies on Headache. *Kunkle, E. C., et al.* . . . 253
- BAL Therapy of Severe Peripheral Neuropathies. *Furmanski, A. R.* . . . 270
- Studies on Sweat Secretion in Man. I. *Neitsky, M. G.* . . . 279
- Peripheral Neuropathy in Neural Leprosy. *Pessin, J., and Kittle, C. F.* . . . 288
- Unrelated Neurologic Syndromes in Patients with Syphilis. *Maillard, E. K.* . . . 297

CHICAGO NEUROLOGICAL SOCIETY.

- Transplantation of Autogenous Nerve Graft in a Major Nerve Trunk. *Spiegel, I. J.* . . . 321
- EEG Indications of Cortical and Subcortical Activity. *Darrow, C. W.* . . . 322
- Etiologic Factors in Experimental Neurosis from the Standpoint of Behavior. *Yacorzynski, G. K.* . . . 323
- Electromyographic Studies on Cats after Section and Suture of the Sciatic Nerve. *Golseth, J. G., and Fizzell, J. A.* . . . 324
- Tactile, Auditory and Visual Areas of the Cerebellum. *Snider, R. S.* . . . 325
- Simulated Epilepsy. *Hammond, R. D.* . . . 327
- The Central Effect of Curare. *Case, T. J., and Funderburk, W. H.* . . . 328

Changes in Brain Structure and Memory After Intermittent Exposure to Simulated Altitude of 30,000 feet.

Young adult male guinea-pigs were subjected to conditions simulating an altitude of 30,000 feet in a decompression chamber six hours daily and six days weekly for 100, 150, 200 or 250 hours. At appropriate times, the experimental animals and controls were killed by perfusion through the vascular system of a solution of formaldehyde to fix and preserve the nervous system and other organs in situ. Histologic technique was carefully controlled.

The animals responded to reduced barometric pressure by maintaining a quiescent state, usually with episodes of physical distress, collapse and, apparently, unconsciousness. After their removal from the chamber, comparison with controls rarely revealed significant behavioural or physical differences. No permanent neurologic defects could be observed. Some loss of weight occurred.

Twenty-four of the animals were trained to solve an alternation maze to the point of perfection. Four controls were picked at random from the superior half of a group of initial learners and 5 from the inferior half of this group. The rest of the animals were exposed to conditions of simulated altitude.

All animals were retested after 100 hours at low pressure. No difference in retentive capacity between the control and the experimental group was noted at that time. After 150, 200 and 250 hours of decompression, groups consisting of 4 experimental animals showing the greatest signs of distress in the chamber at the time and 2 or more controls selected at random were retested and then killed for study of pathologic changes in the brain. In all these retests, the controls exhibited perfect retention of memory, while all the experimental animals gave evidence of retentive loss. The most significant impairment of memory occurred in the samplings from the 150 and 250-hour groups; a closer correlation with pathologic alterations in the brain could be made in these groups than in the sampling from the 200-hour group. However, all experimental animals in the 200-hour group required retraining on the retest, whereas their controls did not.

Focal areas of degeneration occurred in the vermis of the cerebellum of all animals of the 200 and 250-hour groups and in 3 of the 7 animals studied in the 100 and 150-hour groups. Elsewhere in the brain, small areas of cell shrinkage or (less commonly) impaired staining occurred, fortuitously it seemed. For the most part, the tissues of the brain appeared normal, and most regions looked exactly like comparable regions in the control brains. The focal areas of degeneration or other structural change may have resulted from vascular stasis; leukostasis was encountered in the 250-hour group.

The present experiments demonstrated that anoxia prevailing under the conditions of an altitude of 30,000 feet did not in itself cause demonstrable structural

changes in the brain, but that it indirectly brought about focal defects. The impairment of memory occurred without specific correlation with pathologic changes in the brain. (Authors' abstr.)

Dynamic Anatomy of the Cerebral Circulation.

By means of dye injection technique in living human subjects, the partition and distribution of the circulation of the head were studied.

Evidence is presented that blood entering the brain via each internal carotid artery is distributed almost wholly to the ipsilateral hemisphere and drained predominantly by the internal jugular vein on the corresponding side.

Evidence is presented that blood in each internal jugular vein is fairly representative of the drainage from all the histologic components of the brain.

The data indicate that blood in the internal jugular vein at the level of the superior bulb is relatively free of blood derived from extracerebral sources. On the other hand, blood in the external jugular vein contains a significant fraction of cerebral venous blood.

In 7 patients, the total cerebral blood flow was estimated by a dye dilution technique from samples obtained simultaneously from the internal jugular bulbs.

The relation of these findings to various suggested methods for measuring human cerebral blood flow is discussed. (Authors' abstr.)

Studies on Headache: Analysis of Vascular Mechanisms in Headache by Use of the Human Centrifuge, with Observations on Pain Perception Under Increased Positive G.

Exposure to a positive acceleration of 3.0 or 4.0 g. (centrifugal forces in the head to seat direction) on the human centrifuge had little or no effect on the pain threshold to the stimulus of radiant heat or on the intensity of pain induced by a variety of stimuli.

Experimentally induced headaches of non-vascular origin arising from compression or irritation of the surface tissues of the head were only slightly reduced in intensity during exposure to a positive acceleration of 3.0 g.; the minor changes in such headaches were attributable to distraction.

Experimentally-induced headaches of moderate severity arising from distention of cranial arteries (histamine and caffeine-withdrawal headaches) were eliminated during exposure to positive accelerations of 2.0 or 3.0 g., a relief attributable to a concurrent fall in intravascular pressure at the head level.●

Clinical headaches of vascular origin responded similarly, for in subjects experiencing headache related to hunger, recent head trauma or emotional tension, all with clinical features suggesting that the pain arose from distention of intracranial or extracranial arteries, the headache was completely eliminated during exposure to a positive acceleration of 2.0 g.

A brief headache was sometimes noted in the normal subject during release from increased positive g.; such headache probably arises from transient distention of cranial arteries, and in this respect is the analogue of headache induced by negative g.

The human centrifuge is a useful tool in the analysis of vascular mechanisms in headache. (Authors' abstr.)

OCTOBER.

- *Psychomotor Epilepsy. *Gibbs, E. L., et al.* 331
- The Human Electromyogram in Response to Nerve Stimulation, etc. *Hodes, R., et al.* 340
- *Changes in the Brain Associated with Electronarcosis. *Alpers, B. J., and Madow, L.* 366
- *The EEG of Multiple Sclerosis. *Zeifert, M.* 376
- Gangrene of Face Following Occlusion of Posterior Inferior Cerebellar Artery. *Savitsky, N., and Elpern, S. P.* 388
- Untoward Reactions to Curare Consequent to Vagal Hyperactivity Following ECT. *Altschule, M. D., and Tillotson, K. J.* 392
- Experimental Masochism. *Masserman, J. H., and Jacques, M. G.* 402
- *Canine Epilepsy Caused by Flour Bleached with Nitrogen Trichloride ("Agene"): III. EEG Analysis. *Silver, M. L., et al.* 405

Psychomotor Epilepsy.

Three hundred patients with epilepsy whose electroencephalogram showed a psychomotor type of discharge were studied; 90 per cent. had a history of clinical psychomotor seizures. In all cases a spike focus could be demonstrated in the anterior temporal area on one or both sides. This focus was most readily demonstrable during natural or induced sleep.

Psychomotor epilepsy is a specific epileptic syndrome characterized by clinical psychomotor seizures and by an epileptic type of involvement of the anterior portion of the temporal lobe, as evidenced by a focus of spike seizure activity in that area; it is usually associated with personality disorder.

The incidence of epilepsy in near relatives of patients with a psychomotor type of focus is almost ten times as high as in the general population and at least as great as the familial incidence of "idiopathic" epilepsy. This suggests that the tendency to a focus in the anterior temporal area can be inherited.

Patients with psychomotor epilepsy are rarely benefited by treatment with any or all of the anti-epileptic substances at present available. The focus is located in an accessible "silent area." In severe cases surgical removal of the discharging region should be attempted. (Authors' abstr.)

Changes in the Brain Associated with Electronarcosis: Report of a Case.

The pathologic changes in the brain of a patient who died three hours after the first treatment with electronarcosis are reported.

1. There were distinct, recent hemorrhages in the caudate nuclei, the medial nucleus of the thalamus, the posterior hypothalamic nuclei, the supraoptic nucleus, the cerebellum and the choroid plexus of the lateral ventricles.

2. There were fresh, smaller hemorrhages in the cerebral cortex, the corpus callosum, the optic tract and the pineal gland.

These changes must be considered related to the treatment, in view of the time relation, the nature of the lesions and the absence of any other probable causative agent. (Authors' abstr.)

The Electroencephalogram of Multiple Sclerosis: Review of the Literature and Analysis of Thirty-Four Cases.

The electroencephalogram was abnormal in 62 per cent. of 34 cases of multiple sclerosis in exacerbation.

In this series an abnormal electroencephalogram was more consistently associated with multiple sclerosis in exacerbation than was a first zone colloidal gold curve.

This series revealed no electroencephalographic signs specifically diagnostic of multiple sclerosis.

In obscure cases with no objective evidence of cortical or subcortical involvement, the electroencephalogram may be used to differentiate multiple sclerosis from pure spinal cord disease. (Authors' abstr.)

Canine Epilepsy Caused by Flour Bleached with Nitrogen Trichloride ("Agene"): III. Electroencephalographic Analysis.

The electroencephalographic abnormalities developing progressively in dogs when they ingest an otherwise nutritionally adequate diet containing 75 per cent. white wheat flour bleached with "agene" (nitrogen trichloride) are shown to resemble the electroencephalographic patterns associated with human idiopathic epilepsy. (Authors' abstr.)

ARCH. PATH.

VOL. XLV.

MAY, 1948.

Craniolacunias. Wyatt, J. P., and Goldenberg, H. 667

VOL. XLVI.

AUGUST, 1948.

Diffuse Angiectasis of the Cerebral Meninges of the Newborn Infant. Potter,

E. L. 87

ARCH. PSICOL. NEUROL. PSICHIAT.

VOL. IX.

DECEMBER, 1948.

- The Apparent Obsessive and Dissociative Psychopathy of the Poet Rilke.
De Nicola, P. 363
- The Idea and its Creation in the Insane by Invisible Means. *Cardona, F.* . . 375
- "Scriptochronography." *Katz, D.* 395
- The Form and Significance of the Process of Inversion of Figure and Background. *Dalla Volta, A.* 403

BRAIN.

VOL. LXXI.

DECEMBER, 1948

- Olivoponto-cerebellar Atrophy. *Critchley, M., and Greenfield, J. G.* . . 343
- Subacute Inclusion Encephalitis. *Brain, W. R., et al.* 365
- Thrombosis of Intracranial Veins. *Kendall, D.* 386
- The Effect of the Intracisternal Injection of Saline Solutions on the Pressure of the C.S.F. of the Dog. *Bedford, T. H. B.* 403
- The Copper and Iron Content of Brain and Liver in the Normal and in Hepato-lenticular Degeneration. *Cummings, J. N.* 410
- On a Possible Relationship Between Hereditary Ataxia and Peroneal Muscular Atrophy, etc. *Roth, M.* 416
- The Lipidoses and the CNS. *Bird, A.* 434
- Sarcoidosis with Involvement of the Nervous System. *Colover, J.* . . . 451

BR. J. MED. PSYCHOL.

VOL. XXI.

FEBRUARY, 1949.

- Pediatrics and Psychiatry. *Winnicott, D. W.* 229
- Notes on the Psychopathology of Anorexia nervosa. *Scott, W. C. M.* . . . 241
- Disorders of the Ego in Wartime. *Schönberger, S.* 248
- Clinical Observations on Morbid Periodicity. *Inman, W. S.* 254
- Some Psychological Observations on ECT. *Plant, A. B. J.* 263
- On the Structure of the Depersonalization-Neurosis. *Winnik, H.* 268
- The Moral Function as an Objective Social Phenomenon. *Kinberg, O.* . . . 278

BR. J. PSYCHOL.

VOL. XXXIX.

DECEMBER, 1948.

- Colour Blindness in the Left Eye Following an Accident. *Pickford, R. W.* . 73
- Psychiatric Observations in the Arctic. *Grygier, T.* 84
- Psychical Research and Experimental Psychology. *Thouless, R. H.* . . . 97
- The Development of Imaginative Construction in Children. *Vernon, M. D.* . 102

BULL. LOS ANGELES NEUR. SOC.

VOL. XIII.

DECEMBER, 1948.

- Cranial Injuries Among the Indians of North America. *Courville, C. B.* . 181
- Massive Intraventricular Epidermoid. *Ducker, H. W., and Sanchez-Perez, J. M.* 220
- Penicillin Therapy in Multiple Brain Abscesses. *Cuneo, H. M.* 228
- Fear Reaction Induced by Aphasia. *Thompson, G. N.* 233

VOL. XIV.

MARCH, 1949.

- Analysis of EEG Findings in Forty Cases of Verified Brain Tumour. *Cuneo, H. M., et al.* I
- Intravenous Procaine Hydrochloride in the Treatment of Asphyxia Due to Carbon Monoxide. *Olson, C. W., et al.* 23
- Unilateral Prefrontal Lobotomy for Relief of Intractable Pain. *Vogel, P. J., and Hjartarson, G. D.* 32
- The Glomus Tumors. *Reeves, D. L.* 40

CERVELLO.

VOL. XXV.

1949.

Yellow Pigment in the Cortex at the Foot of the Third Frontal Convolution in Man. <i>De Leonardis, L.</i>	1
An Exceptional Etiological Factor in Lateral Amyotrophic Sclerosis. <i>Nistri, M.</i>	20
Psychic Upset during the Developmental Age. <i>Irapi, G.</i>	27
Some Present-day Rarities in the Clinical Aspects of the Catatonic Syndrome. <i>Chiaramonti, E.</i>	46

DIS. NERV. SYST.

VOL. IX.

DECEMBER, 1948.

Multiple Sclerosis. <i>Potterfield, T. G., and Rupp, C.</i>	359
Surgical Results in Benign Brain Tumors. <i>Greenwood, J.</i>	362
Psychologic Studies as Aids in Differential Diagnosis of Brucellosis and Psychoneurosis. <i>Harris, H. J.</i>	364
Pseudomaturity. <i>Blackman, N.</i>	370
Disparagement. <i>Bergler, E.</i>	375

VOL. X.

JANUARY, 1949.

Motor and Sensory Phenomena during Therapeutic CO ₂ Inhalations. <i>Meduna, L. J., and Gyarfás, K.</i>	3
Cardiac Complications in Electroshock Therapy. <i>Linn, L., and Otterheimer, J. G.</i>	8
Some Psychiatric Aspects of Cardiovascular Disease. <i>Morris, D. P.</i>	11
Attempted Suicide. <i>Wallinga, J. V.</i>	15
The Influence of Hypnosis on the Tremor of Parkinson's Disease. <i>Buell, F. A., and Biehl, J. P.</i>	20

FEBRUARY.

Entropy, Mental Disease and Death. <i>Danziger, L.</i>	35
*Phenurone in Epilepsy. <i>Gibbs, F. A., et al.</i>	47
The Use of Sodium Ametyl and Benzedrine Sulfate in the Symptomatic Treatment of Depressions. <i>Gottlieb, J. S.</i>	50
The Dynamics of Juvenile Delinquency. <i>Bollmeier, L. N.</i>	53
Combined Penicillin and Malarial Fever Treatment in Cerebrovascular Syphilis. <i>Craddock, W. L.</i>	55

MARCH.

The Foundation of a Psychiatric Counseling Clinic in a Small City. <i>Walsh, M. N.</i>	67
Psychodrama as a Medium for Mental Hygiene Education. <i>Hagan, M.</i>	74
Management, Care and Treatment of Mentally Ill Tuberculous Patients in West Virginia. <i>Knapp, J. L., and Cain, J. R.</i>	81
Psychotherapy in Chronic Ulcerative Colitis. <i>Trawick, J. D.</i>	84

Phenurone in Epilepsy.

Phenacetylurea (phenurone) has been shown to possess superior anticonvulsant properties against both electro-shock and metrazol convulsions in animals and is a drug of low toxicity.

This drug is an important addition to the therapeutic agents that are used for the treatment of epilepsy, for it will in some cases control seizures that are not controlled by any other medication. In the present series it was found useful against all types of seizure and was uniquely effective against psychomotor seizures. Phenurone may be used alone or in combination with Mesantoin or phenobarbital. The chief limiting side effect is the intensification of pre-existing personality disorders. It should be used with caution in such cases. Since Phenurone can

increase the non-ictal psychiatric symptomatology while reducing the ictal or purely epileptic component, it reveals an antithesis between these two components.
(Authors' abstr.)

EDUC. PSYCHOL. MEASMT.

VOL. IX.	1949.
Diversity of Self Endorsements as a Measure of Individual Differences in Personality. <i>McQuitty, L. I.</i>	3
Current Practices in Evaluation in City School Systems. <i>Michaelis, J. U.</i>	15
The Predictive Efficiency of the 1946 Revision of the Iowa Legal Aptitude Test. <i>Adams, M., and Stuit, D. B.</i>	23
Status Anxiety and Occupational Choice. <i>Levin, M. M.</i>	29
The Meaning of "Validity" and "Reliability" as Applied to Sociometric Tests. <i>Pepinsky, P. N.</i>	39
Effect of Speed on Item-Test Correlation Coefficients. <i>Wesman, A. G.</i>	51
The Professed and Measured Interests of Vocational Rehabilitation Counselors. <i>Di Michael, S. G.</i>	59
Predicting Mathematics Grades of Veteran and Non-veteran Students. <i>Frederiksen, N.</i>	73
The Dependence of Factorial Composition of Aptitude Tests Upon Population Difference Among Pilot Trainees. II. <i>Dudek, F. J.</i>	95
Some Trends in the Development of Psychological Tests. <i>Woodruff, A. D. D., and Pritchard, M. W.</i>	105

EEG CLIN. NEUROPHYSIOL.

VOL. I.	FEBRUARY, 1949.
Symposium on Physiological Basis of Epileptic Discharge. Epileptic Manifestations of Cortical and Supracortical Discharge. <i>Penfield, W.</i>	3
*Electrical Signs of Epileptic Discharge. <i>Jasper, H. H.</i>	11
Mechanism for the Spread of Epileptic Activation of the Brain. <i>McCulloch, W.</i>	19
Mechanism for the Spread of Epileptic Activity of the Brain. <i>Darrow, C. W.</i>	25
Biochemical Approaches in the Study of Epilepsy. <i>Elliott, K. A. C.</i>	29
The Neuropharmacology of Anti-epileptics. <i>Toman, J. E. P.</i>	33
*Influence of Drugs on the Human EEG. <i>Lennox, W. G.</i>	45
*The Central Effects of Rhythmic Sensory Stimulation. <i>Walter, V. J., and W. G.</i>	57
*The Electroretinogram of Man. <i>Monnier, M.</i>	87

Electrical signs of Epileptic Discharge.

1. The only form of electrical activity which is thought to characterize a local epileptogenic lesion of the cortex is the random spike discharge.
2. The local spike discharge must become repetitive at a fairly rapid frequency before sufficient activation occurs to cause a change in behaviour or awareness of the patient.
3. The spread of epileptic activation is manifest by an enhancement of the background spontaneous rhythms before the form of its activity is changed to a multiple spike pattern indicating violent local autonomous activation of this distant cortical area. Specific regions may produce a depression in background activity at the onset of an attack.
4. Large areas of the cortex may be activated by electrical signs of epileptic activity, with little obvious change in the patient, these areas being the anterior frontal region and large portions of the temporal and parietal lobes. Spread to subcortical structures seems likely when changes in level of consciousness and behaviour automatisms are associated with epileptic discharge.
5. The cerebral cortex alone, isolated from connections to subcortical structures, is capable of maintaining epileptic after-discharge, so that long reverberating circuits are not required for this process.
6. Rhythmic epileptic activity of large areas of the cortex synchronized in one hemisphere or bilaterally synchronous from homologous regions of the two

hemispheres, most probably has its pacemaker in the thalamus since from the thalamus such rhythmic bilateral disturbances can be induced by local electrical stimulation. Other subcortical projection systems may also be involved.

7. Local cortical epileptic discharge may also be initiated by local thalamic stimulation of the more directly projecting thalamic nuclei.

8. Subcortical rhythmic systems, projecting to large areas of both hemispheres can also be actuated by local cortical epileptic discharge, most readily in certain portions of frontal and temporal regions.

9. The clinical pattern of an epileptic seizure is not closely related to the form of associated EEG disturbance but rather to the functional area of the brain primarily involved and the functional characteristics of the neuronal circuits involved in the path of spread.
(Author's abstr.)

Influence of Drugs on the Human Electroencephalogram.

The interrelationships of pharmacology, seizures and dysrhythmia are discussed. Correlations have been made between clinical and electroencephalographic improvement in 100 patients receiving drug therapy. The two follow a broadly parallel course, changes in seizures and tracings being grouped simply as normal, improved or unimproved. In 66 per cent. of 108 periods of treatment, there was complete correlation. In 30 per cent. clinical improvement exceeded electrical improvement, in four per cent. the reverse was true. Clinical improvement and also complete correlation between seizures and dysrhythmia was more evident in patients with *petit mal* (73 per cent. correlation) than in those with other types of seizures (57 per cent. correlation).

Medication seems to influence seizures, or an "externalizing mechanism" before it influences the dysrhythmia of an interseizure recording. Broadly speaking, repeated electroencephalograms assist in judging the progress of treatment and the prognosis of epilepsy.
(Author's abstr.)

The Central Effects of Rhythmic Sensory Stimulation.

1. Records obtained during photic stimulation may be described in terms of the following components, any or all of which may be present at any one time or from time to time.

(a) A series of discrete elementary evoked responses.

(b) Fusion of evoked responses giving an accidental appearance of rhythmicity.

(c) Instrumental summation of evoked response and spontaneous rhythms.

(d) True augmentation or "driving" of local rhythms at the frequency of the stimulus.

(e) Augmentation of harmonically related rhythms in other areas.

2. Differences between individuals are attributable in some cases to anatomical variations and correlate also to some extent with the character of their spontaneous activity, with age and with differences in personality.

3. Alterations in the response in given individuals are produced by somatic, mental and emotional changes whether spontaneous, voluntary or induced.

4. Somatic, mental and emotional changes can be induced in the subject by stimulation at appropriate frequencies.

5. The above effects can interact with one another in both regenerative and degenerative fashion.

6. Subjective visual effects are attributable to interference between rhythmic evoked responses and spontaneous rhythms at cortical and possibly thalamic levels.

7. Anomalous (non-visual) effects in normal and abnormal subjects are attributed to interaction between the evoked activity and harmonically related spontaneous rhythms in other circuits at a thalamic level.

8. Evocation of activity in non-visual circuits can be used to study their physiology and as an aid to diagnosis of some pathological conditions.

9. Some theoretical implications of these findings are speculatively discussed.
(Authors' abstr.)

Electroretinogram of Man.

A method of perimetric electroretinography is described by means of which the action of duration, intensity, colour and location of the light stimuli on the human ERG can be studied.

The analysis of more than 1,800 records confirms that the human ERG belongs to Granit's E type. Its most characteristic feature is the *b* potential, quantitatively defined by the latency, the duration of the ascendant phase or culmination time, and the amplitude, *a* and *c* potentials are small and often variable. There is no positive off-effect.

Binocular electroretinography elicits, together with a normal ERG in the illuminated eye, a consensual response in the other eye, a reaction which seems to be coincident with the pupillary consensual reflex.

The ability of the retina to differentiate light changes can be measured objectively by the fusion frequency of the small *b* potentials, elicited by flicker stimulation. The fusion occurs normally at a rate of more than 19-20, often of more than 26 flashes per second.

The ERG in man varies not only with the duration, but also with the intensity of the stimulus. Increase of intensity produces a decrease in the latency and culmination time of potential *b*, as well as an increase in its amplitude.

Perimetric electroretinography permits the study of the reactivity of various retinal areas and the objective delimitation of the visual field. In the normal subject, stimulation of peripheral areas (60° nasal retina) produces an ERG with longer latency and culmination time, and smaller amplitude of the *b* potential than those elicited by stimulation of more central areas.

Stimulation of the retina with monochromatic light stimuli elicits: (1) A photopic component, particularly marked when the central area of the retina, adapted to light, is stimulated with red light; (2) a scotopic component, with slow and broad "*b*" potential, particularly marked when the peripheral area of the retina, adapted to darkness, is stimulated with blue light. This scotopic response shows a longer culmination time when the wave-length of the stimulus decreases; it reaches its maximum when the peripheral retina is stimulated with blue light.

Simultaneous recording of ERG and EEG permits measurement of the retino-cortical time, as well as of the alpha-blocking time. The retino-cortical time, that is, the latency of the evoked potentials, is more constant than the alpha-blocking time, being only 50 m.sec. (= 15). Measurement of the retinal time, the retino-cortical time, and the alpha-blocking time can provide useful information about the functional state of the various sections of the visual tracts and centres.

(Author's abstr.)

ENCEPH.

VOL. XXXVII.	1948.
Presbyophrenia. <i>Bessiere, R.</i>	313

GENET. PSYCHOL. MONOGR.

VOL. XXXVIII.	NOVEMBER, 1948.
*Schizophrenia and the MAPS Test. <i>Shneidan, E. S.</i>	145
A Study of the Transmission of Authority Patterns in the Family. <i>Ingersoll, H. L.</i>	225

VOL. XXXIX.	FEBRUARY, 1949.
A Study of the Psychoanalytic Theory of Psychosexual Development. <i>Blum, G. S.</i>	3
The Assessment of Parental Aptitudes in Relation to Child Adjustment. <i>Shoben, E. J.</i>	103

GERIAT.

VOL. IV.	JANUARY, 1949.
A Study of Depressive States in the Ageing. <i>Clow, H. E., and Allen, E. B.</i>	11

VOL. IV.

MARCH-APRIL, 1949.

Psychological Orientation in Geriatrics. <i>Allen, E. B.</i>	67
The Endocrine Aspects of Gerontology. <i>Turner, H. H.</i>	74
The Carotid Sinus Syndrome. <i>Evans, E.</i>	90
Neurological Disorders in Later Life. <i>Pollock, L. J.</i>	108

INDIV. PSYCHOL. BULL.

VOL. VII.

1949.

Teaching of Mental Hygiene. <i>Feichtinger, F.</i>	5
The Common Sense of Sex Education. <i>Beecher, W.</i>	12
First Memories of "Normal" and of "Delinquent" Girls. <i>Plotke, P.</i>	15
Geriatrics and Gerontology in Every-day Practice. <i>Ginzberg, R.</i>	21
Individual Psychology in Germany. <i>Ansbacher, H. L., and Bornemann, A.</i>	30

INTER-ALLIED CONF. WAR MED.

VOL. I.

1947.

Man-power Conservation. <i>O'Malley, C. J. S.</i>	53
Man-power Conservation. <i>Ward, F. G.</i>	58
Functional Nervous States in Relation to Service in the Royal Navy. <i>Curran, D.</i>	219
Neurosis on Active Service in the British Army. <i>Rees, J. R.</i>	224
Neurosis on Active Service. <i>Thompson, L. J.</i>	225
Neurosis on Active Service. Experiences in the M.E.F. <i>Craigie, H. B.</i>	228
Neurosis on Active Service. Experience Among Aircrew on a Bomber Station. <i>Reid, D. D.</i>	230
*Operational Strain. <i>Curran, D.</i>	233
Operational Strain. Psychological Casualties in the Field. <i>Thompson, L. J.</i>	239
*Operational Strain. Experiences with the M.E.F. <i>James, G. W. B.</i>	242
Operational Strain. Stress in Combat Flyers. <i>Wright, D. C.</i>	244
Management of Combat Exhaustion in the Army. <i>Thompson, L. J.</i>	246
*Exhaustion in Relation to Fighting Efficiency. <i>Critchley, MacD.</i>	289
Night Vision Training and Night Vision in Operational Flying. <i>MacGown, J. C.</i>	405

Operational Strain : Psychological Casualties in the Royal Navy.

Psychological casualties are rather more frequent ashore than afloat. This striking discrepancy is not to be wholly explained by the concentration of the despised and rejected ashore. The author does not believe the men who report sick ashore with psychiatric symptoms do so mainly to evade their draft or their duty nor that they fake their symptoms. Rather he believes that reduction of tension ashore coupled with the uncomfortable consciousness of reduced speed and with inability to adjust easily to the different tempo makes for the greater incidence of psychiatric problems ashore. Like the difficulties and breakdowns occurring in civilian life on retirement, the naval men ashore miss the stimulation to which they are accustomed, even if unpleasant, and cannot stand doing nothing. Leadership qualities of that remarkable caste, the regular naval executive officer, may contribute to the lower incidence of psychiatric problems afloat.

F. C. SUMNER (Psychol. Abstr.)

Operational Strain : Experiences with the Middle East Force.

From the author's experience with psychiatric casualties in the Middle East Force certain proposals are made for reducing such casualties, namely: (1) a ruthless selection of psychological screening; (2) 2 beds for psychiatric casualties per 1,000 of the force; (3) first aid treatment of psychological casualties which the author summarizes in the simple text: "Fluid, food, sleep and stool"; (4) good rehabilitation; (5) an organization which will get recovered men back to their duty with the minimum of waiting and with a pleasant reception into the unit; (6) re-selection of men before returning them in order that suitable fresh employment may be found.

F. C. SUMNER (Psychol. Abstr.)

Exhaustion in Relation to Fighting Efficiency; Reactions of Men to Long Periods in Open Boats.

Here is described the psychological state of torpedoed sailors spending 10, 20 or 30 days in an open boat under severe physical conditions, and in the company of shipmates who are becoming delirious or who are dying off one by one. The earliest mental changes are affective in nature, ranging from acute anxiety while struggling in the water to wild elation when picked up. Agonal bioscopic fantasies, panoramic memories and the like frequently occur while a man is fighting for his life in the water. As hardships pile up amongst the lifeboat company the sensorium becomes clouded as evidenced in a defective appreciation of time, increasing lack of awareness, a tendency to day-dream of food and drink, and later in fantasy-building, in actual vivid hallucinations usually visual, and in delirium. Behavior of the men within the life-boat exhibits mob-psychology features: hysterical suggestibility, exaggerated dependence upon person assuming command, mental contagion, impression of a "presence," visual hallucinations of rescue ships common to the group. After rescue the mental state is usually one of euphoria followed by motor restlessness and insomnia as the physical exhaustion and mental distress wear off. Late reactions of an anxiety-type are common. Persistent psychiatric incapacity is the exception, occurring in only 50 out of the author's series of 285 shipwrecked sailors.

F. C. SUMNER (Psychol. Abstr.)

INTERNAT. J. PSYCHO-ANAL.

VOL. XXIX.

1948.

Symposium on the Evaluation of Therapeutic Results. Oberndorf, C. P., et al.	7
On Genital Lore. Balint, M.	34
Heredity and Psychoanalysis. Van der Waals, H. G.	41
Analysis of a Cartoon in a Case of Hypochondriasis. Munro, L.	53
A Technical Problem in the Treatment of the Infant Patient. Joseph, B.	58

J. AB. SOC. PSYCHOL.

VOL. XLIV.

JANUARY, 1949.

The Systematic Intent of Clinical Psychology. Rosenzweig, S.	3
Psychodiagnosis in Clinical Practice and Personality Theory. MacKinnon, D. W.	7
Personality Research and Psychopathology as Related to Clinical Practice. Zubin, J.	14
Some contributions of Psychotherapy to Personality Theory. Snyder, W. U.	22
A Phenomenological Approach to Adjustment Theory. Combs, A. W.	29
Integration of Personality Theory and Clinical Practice. Roe, A.	36
A Clinical Perspective for Personality Research. Klein, G. S.	42
The Dilemmas of German Youth. Fried, E. G., and Lissance, M. F.	50
*A Study of Schizophrenic Language. White, M. A.	61
Stammering and Language Learning in Early Childhood. Wyatt, G. L.	75
Classifying High-Grade Occupational Interests. Vernon, P. E.	85

A Study of Schizophrenic Language.

If "word identification" is thought of as the way in which schizophrenics interpret, or misinterpret, language, then we might say that: (1) Schizophrenics are unwilling to attempt an interpretation of confused language while normals are willing. (2) When they do interpret, schizophrenics prefer to "see" confused language as whole words rather than as letters. This they do even though nonsense words result. It would seem that schizophrenics need to make generalizations of what is confused or blurred even though the generalization, a word in this instance, may not make sense.

If "word arrangement" is thought of as the way in which schizophrenics categorize language, then it appears that: (1) Schizophrenics group into complex patterns rather than into simple categories. (2) Schizophrenics avoid personal themes, preferring moral and impersonal themes of morality, religion, life and death. These findings in general concur with those of Kasanin who used Vigotsky's object sorting test. Kasanin observed that schizophrenics failed to group

as do normals, but substituted broad principles of classification which were difficult to analyze. This is true in language also. However, while Kasanin found schizophrenics "personalizing" inanimate objects, we find them "de-personalizing" language although most normals use personal references. Universal themes, of quite a complex nature, are substituted for the simpler "What I like—what I dislike" sorting of the normals. It might be conjectured from this that schizophrenics, lacking a feeling of personal identification with the normal world, personalize the impersonal as an alternative, creating an identity with moral and universal ideas. The universal themes found in this study suggest that the patient was identifying himself with humanity in general, rather than with himself.

Another of Kasanin's observations with regard to object sorting is corroborated, namely, that schizophrenics find it difficult to shift from one category to another. Schizophrenics found it more difficult to change their word sortings, often holding to their initial grouping. Kasanin found they held their initial classification even after the correct solution was explained.

While Cameron's work was based also on Vigotsky's sorting test, more attention was paid to the patient's explanation of his actions. These protocols were similar to the sorting and explanation required in this study. Cameron observed that the patient's explanations were inclusive and involved. He has explained his results as due to inadequate role-taking skills. Not being able to see his own behaviour as others see it, the schizophrenic, in Cameron's opinion, has lost the social function of language. To this writer, however, language is a means of communication, and in schizophrenic language we find that the schizophrenic is communicating with such universalities as "God," "life," "body," or "every child." These concepts have become part of his social intercourse, and for that reason the complex and impersonal language which he uses becomes an appropriate means of communication with humanity and the infinite.

Of the "word sentences" test, we conclude that: (a) Schizophrenics persevere in language, lacking the variability of normals; (b) schizophrenics lack completeness of thought; (c) schizophrenics avoid personal reference in language. In this part of the study, an experimental technique was used to test Bleuler's and Kraepelin's descriptions of schizophrenic language. The point must be stressed again that the patients in the author's experiment were studied early in their hospital course, and undoubtedly do not represent the more serious stage of the illness observed by these two clinicians. Since many of Bleuler's and Kraepelin's signs were not found in the author's group, we might conclude that neologisms, rhyming, akataphasia, word salads, condensations and symbolization do not appear early in schizophrenia but do appear in "demented" *praecox*. Both Bleuler and Kraepelin, however, made note of perseveration or stereotypy, which appeared in this study. This last fact suggests the earlier appearance of stereotypy in the illness than of the other types of language disorders. Bleuler also noted the tendency toward generalizations. This also was shown in this study in a related way, in the use of impersonal sentences instead of personal. Schizophrenics are not as simple, direct, or personal in the formation of their language as are normals.

The perseverative quality in schizophrenic language was also found by Woods in his patients. What Woods calls an "inexact" or "indefinite" type of speech "a tendency to great vagueness," may again be the lack of personalization which was revealed in the present groups. However, the occurrence of "slipping" and metaphors, which Woods observed, are not corroborated by this study. This suggests that these signs are more typical of an advanced stage. Woods' patients were from a state hospital, rather than a private one, and probably had been ill for a longer period of time than had the present group, since his group included deteriorated schizophrenics.

(Author's abstr.)

J. ANAT.

VOL. LXXXIII.

JANUARY, 1949.

Spinal Origin of the Ventral Supraoptic Decussation in the Spider Monkey.

Chang, H-T., and Ruch, T. C.

I

The Effect of Peripheral Connexions on the Maturation of Regenerating Nerve Fibres. Aitken, J. T.

32

J. BELGE. NEUROL. PSYCHIAT.

VOL. XLVII.

1947.

- A Case of Idiopathic Auditory Aphasia. *Liessens, P.* 486
 Inferiority Complex in the Stammerer. *Mussafia, M.* 504

J. CLIN. PSYCHOL.

VOL. V.

JANUARY, 1949.

- The Aptitudinal Pathoses. *Thorne, F. C.* I
 The Effects of Test Abbreviation Upon Responses to Individual Items.
Mensh, I. N. 22
 The H-T-P Technique. *Buck, J. N.* 37
 A Psychometric Analysis of Psychoneurotic and Psychosomatic Character-
 istics of Alcoholics. *Manson, M. P.* 77
 "Acceptance" and Related Attitudes as Demonstrated in Psychotherapeutic
 Interviews. *Miller, H. E.* 83
 Psychological Investigation of a Homicidal Youth. *Wittman, P.* 88
 Medical Responsibility for Training in Clinical Psychology. *Kubie, L. S.* 94
 Remarks on the Use of the Wonderlic Personnel Test as a "Pre-Test."
Lindzey, G. 100

J. COMP. NEUR.

VOL. LXXXIX.

DECEMBER, 1948.

- An Attempt to Innervate Sweat Glands Through Preganglionic Fibres.
Hollinshead, W. H. 193
 The Olivo-cerebellar System. *King, R. B.* 207
 Intrinsic Nerves in the Mammalian Kidney. Part I. *Harman, P. J., and*
Davis, H. 225
 The Distribution of the Anterior Commissure in the Monkey (*Macaca*
mulatta). *Fox, C. A., et al.* 245
 Structure and Relations of Limbic Cortex and Anterior Thalamic Nuclei in
 Rabbits and Cats. *Rose, J. E., and Woolsey, C. N.* 279
 Certain Developmental Relations and Fiber Connection of the Triangular
 Gyrus in Primates. *Lockard, I.* 349

VOL. XC.

FEBRUARY, 1949.

- The Development and Connections of the Mesencephalic Root of the Trige-
 minal Nerve in Man. *Pearson, A. A.* I
 A Study of the Development of Fiber Tracts in the Brain of *Amblystoma*
 after Excision or Inversion of the Embryonic Di-mesencephalic Region.
Piatt, J. 47
 The Localization Within the Dorsal Motor Vagal Nucleus. *Getz, B., and*
Sirnes, T. 95
 Functional Representation in the Motor Trigeminal Nucleus. *Szentagothai,*
J. 111
 The Histochemistry of the Mammalian Area Postrema. *Cammermeyer, J.* 121

J. COMP. PHYSIOL. PSYCHOL.

VOL. XLI.

DECEMBER, 1948.

- What Makes Rats Hoard. *Bindra, D.* 397
 The Effects of Intra-maze Delay. II. *Brown, W. L., and Gentry, G.* 403
 An Experimental Test of the Continuity Theory of Discrimination Learning
 with Pattern Vision. *Ehrerfreund, D.* 408
 *Learning Ability in Rats Given Electroconvulsive Shocks in Late Infancy.
 II. *Porter, P. B., et al.* 423
 Variability in Extinction Scores in Skinner-box Problems. *Walker, E. L.* 432
 The Influence of Different Maze Surroundings on Learning. *Walthall, W. J.,*
jun. 438
 Gradients of Approach and Avoidance Responses and their Relation to Level
 of Motivation. *Brown, J. S.* 450
 Studies in Motivation and Retention. I. *O'Kelly, L. I., and Heyer, A. W.,*
junr. 466

Learning Ability in Rats Given Electroconvulsive Shocks in Late Infancy.

Twenty-nine albino rats were given a daily electroconvulsive shock from the age of 20 to 29 days. From 74 to 90 days post shock (average age, 113 days) they and 27 littermate controls were trained on the Stone multiple-T maze.

Performances of the control group were superior in terms of the percentage of animals attaining a criterion of mastery (3 perfect runs in succession) and in number of forward going errors made in 40 trials. When the performances of these groups were compared with those of comparable groups in two earlier experiments, uniform differences were found between the shocked and the unshocked, without regard to the amount of time allowed for recovery between the series of convulsions and the period of testing. In this as well as the foregoing studies the groups did not differ significantly in rates of running; also, there were no differences which could rightly be attributable to emotional disturbances among the experimental.

These findings are interpreted as indicating that: (1) ECS effects a small permanent decrement in ability to learn a relatively difficult maze; (2) this decrement is most likely due to brain injury, from which partial recovery is rapid, and (3) the degree of defect is relatively uniform in all individuals of a homogeneous group of rats. (Authors' abstr.)

FEBRUARY.

1949.

Effect of a Secondary Reinforcing Agent in Black-White Discrimination. Ehrerfreund, D.	I
The Effect of Prostimine on the Conditioned Response of "Inhibited Dogs." James, W. T., and Ginsburg, G. E.	6
The Effect of Emotionality on the Water Intake of the Rat. Siegel, P. S., and Stuckey, H. L.	
*Effects of Electroconvulsion Shocks on Rat Behaviour in a Dashiell-type of Water Maze. Mullhan, G. J., and Stone, C. P.	17
Time Discrimination in the Rat. Heron, W. T.	27
*The Retroactive Effect of Electroshock on Learning. Duncan, C. P.	32
Prediction and Control of Alertness. III. Travis, R. C., and Kennedy, J. L.	45
The Genetics of Audiogenic Seizures in the House Mouse. Witt, G., and Hall, C. S.	58

Effects of Electroconvulsive Shocks on Rat Behavior in a Dashiell-type of Water Maze.

1. In the free choice situation provided by a Dashiell-type of water maze, normal rats learned to take an "economical" (minimal distance) path. Repetition of a particular "economical" route was common, and among the control group this was most frequently a central alternation path.

2. The shocked group covered longer distances and made a significantly greater number of reversals of direction with respect to the goal than did the controls.

3. The shocked group showed less repetition of particular "economical" routes than did the controls and a greater preference for the peripheral routes. In the shocked animals the evolution of a central-path preference began after the cessation of the shock series, whereas it was almost immediately perceptible in the control group.

4. The convulsed rats, alone, developed a tenseness and fear-like reaction to being removed from their cages and to being placed in the maze. This was rapidly lost after the shock period ended.

5. In problems requiring the acquisition of new routes from start to exit, begun 16 and 26 days after cessation of shocks, the convulsed group showed no certain handicap in habit formation as compared with the controls.

(Authors' abstr.)

The Retroactive Effect of Electroshock on Learning.

1. Nine groups of animals were trained to avoid a charged grid. One trial per day was given on each of 18 days. Eight of the groups received an electroshock of 85 volts A.C. passed through the head for a .2 second at a certain time after

each trial, the time differing for different groups. The control group was run in the same way but received no cerebral shock. Learning was measured by the number of trials in which the animals avoided the grid charge by running before the end of the 10 second CS-US interval.

2. There was a very marked depression of learning in the group which received the convulsive shock 20 seconds after each trial. The depression became progressively less in the 40 second, 1 minute, 4 minute and 15 minute groups. Animals with longer trial-shock intervals (1 hour, 4 hour and 14 hour) did not differ significantly from the controls.

3. An additional control experiment was performed in which four groups of rats were run in the same way as the eight cerebral shock groups but in which the shock following each trial was applied to the back legs. In different groups the leg shock was administered at different times after each trial.

4. In the control experiment only the group of animals shocked through the legs 20 seconds after the daily run showed significantly slower learning. Animals shocked through the legs 60 seconds, 4 minutes, or 45 minutes after each trial showed no impairment in learning. This supports the argument that cerebral shock, at least in the 60 second or longer groups, did not inhibit learning by acting as a punishment.

5. The results were interpreted in terms of a consolidation theory. It was suggested that newly learned material undergoes a period of consolidation or perseveration. Early in this period a cerebral electroshock may practically wipe out the effect of learning. The material rapidly becomes more resistant to such disruption; at the end of an hour no retroactive effect of cerebral electroshock was found. (Author's abstr.)

APRIL.

Effect of Number of Reinforcements on Strength of Approach in an Approach-Avoidance Conflict. <i>Kaufman, E. L., and Miller, N. E.</i>	65
Relationship Between Dominance Control of Movement in Goats. <i>Ross, S., and Scott, J. P.</i>	75
The Effects of Intra-maze Delay. <i>Gentry, G., et al.</i>	81
*Duration of Decrements in Learning and Retention Following Electroshock Convulsions in the White Rat. <i>Braun, H. W., et al.</i>	87
Establishment of Conditioned Responses in Chick Embryos. <i>Hunt, E. L.</i>	107
*The Effects of ECT on Gestation and Maternal Behavior. I. <i>Rosvold, H. E.</i>	118
*Effects of ECT on Learning and Retention in Rats as Functions of Difficulty of the Task. <i>Russell, R. W.</i>	137
Qualitative Food Deficiency as a Drive in a Discrimination Problem. <i>Heron, W. T., and Peake, E.</i>	143
*Effects of ECT on Retention in Rats as Functions of Intensity of ECT Stimulus. <i>Townsend, J. C., et al.</i>	148

Duration of Decrements in Learning and Retention Following Electroshock Convulsions in the White Rat.

This report has described certain experiments which were conducted to determine the duration of the decrements in learning and retention following a series of 25 electroshock convulsions. The Pittsburgh Electroshock Apparatus was employed and insured adequate control of relevant instrumental variables, the most important being the amperage and duration of the electroshock impulse. All learning and retention tests were conducted in the Lashley 111 maze which was slightly modified and adapted for swimming. The 257 animals used were of the Sprague-Dawley strain and were 105 days old at the beginning of each study. At this time their mean weight was 330 grammes.

To ascertain the duration of the impairment in learning, tests were made 24 hours and 30 days after the completion of the series of convulsions. The duration of the decrement in retention was studied by testing for retention at intervals of 24 hours, 30 days, and 60 days following the last convulsion.

The results of these experiments show that a controlled series of 25 electroshock convulsions is followed by a significant impairment of learning ability immediately

after the shock series and that this impairment is still evident 30 days following treatment. In the latter case, the magnitude of the impairment is not as great as that which is found immediately after the shock series.

A decrement in retention also appears 60 days after the convulsive series. This impairment is at least as great as that which was demonstrated immediately after the convulsions.

A controlled series of electroshock convulsions results in occasional paralysis, as well as significant weight losses in the course of the convulsive series.

With the termination of the convulsions, however, these weight losses are eventually overcome. (Authors' abstr.)

The Effects of Electroconvulsive Shocks on Gestation and Maternal Behaviour. I.

The present paper is the first of two reporting the results of an investigation to survey the effect of electroconvulsive shock on gestation and on innately organized patterns of behaviour in the albino rat. For the latter, parturition, nest building, lactation, and retrieving, which are components of maternal behaviour, were used. It was found that:

1. Shocks administered in the latter half of pregnancy do not cause the animal to abort, but prolong gestation and make labor difficult.

2. Electroconvulsive shocks obliterate maternal behaviour if initiated during the last 12 to 15 days of pregnancy and continued until one day post partum.

3. If the series of shocks is applied during the first fifteen days of lactation, maternal behaviour is affected to a considerable degree, but not obliterated. If shock is initiated on the seventh day post partum, i.e., after nest building, lactation and care of young are well established, the disruption is minimal.

4. The severity of the disruption is related to the period of the reproductive cycle during which the shocks are applied.

5. The growth of the young is temporarily retarded if the shocks are applied to the mothers during the lactation period.

6. The effects of the shock did not appear to persist so long as 25 days post-shock.

7. Except possibly in the most severe disturbances, there are great individual differences in the resistance of mothers to the disruptive effects of shock, but when the effects appear, they may be observed, as a rule, in all components of maternal behaviour, although in a variable degree. (Author's abstr.)

Effects of Electroshock Convulsions on Learning and Retention in Rats as Functions of Difficulty of the Task.

In general these results indicate that a series of controlled electroshock convulsions does not affect learning and retention, either immediate or delayed, of a habit at the relatively simple level of difficulty of the straightaway or the single-choice-point maze. These results tend to substantiate conclusions drawn by other research workers studying relatively simple habits under other less adequately controlled conditions.

The major contribution of the present research lies in a comparison of these results of another series of experiments in which an exact duplication of the conditions of the present research existed with the exception of the relative difficulty of the maze habit studied. In this latter instance a five-choice-point maze was employed and very significant decrements in both learning and retention—immediate and delayed—were observed. Since the only difference between the two research designs was the relative difficulty of the tasks to be learned and retained the conclusions seems warranted that the effects of electroshock convulsions on learning and retention are, in part at least, functions of the difficulty of the task or habit involved. (Author's abstr.)

Effects of Electroshock Convulsions on the Retention in Rats as Functions of Intensity of Electroshock Stimulus.

1. Decrements in retention of the maze habit, significant at the one per cent. level of confidence, did occur immediately following the series of controlled electroshock convulsions.

2. The magnitude of these decrements in retention were not related to the intensity of the electroshock impulses employed to induce the convulsions.
3. No latent effects of the convulsions on the relearned habits were evidenced 30 days following immediate post-shock relearning of the maze.
4. Characteristic intraserial learning curves were found for learning both before and after convulsions.
5. Changes in mean weights of the animals occurred during the series of convulsions. A marked loss in weight followed immediately after the start of the series of convulsions, reaching an asymptotic level at approximately the fifteenth daily convulsion. At this point, a gradual increase began which was accelerated rapidly following the last shock treatment. (Authors' abstr.)

J. EX. PSYCHOL.

VOL. XXXIX.	FEBRUARY, 1949.
The Motivational Aspect of an Irrelevant Drive in the Behavior of the White Rat. <i>Webb, W. B.</i>	1
An Experimental Test of a Two-factor Theory of Inhibition. <i>Kimble, G. A.</i>	15
Proactive Inhibition as a Funtion of Time and Degree of Prior Learning. <i>Underwood, B. J.</i>	24
Intensity of the Conditioned Stimulus and Strength of Conditioning. II. <i>Grant, D. A., and Schneider, D. E.</i>	35
Relationship Between Reminiscence and Type of Learning Technique in Serial Anticipation Learning. <i>Buxton, C. E., and Ross, H. V.</i>	41
Transfer of Training from Practice on Components in a Motor Skill. <i>Gagné, R. M., and Foster, H.</i>	47
An Experimental Analysis of Set in Rote Learnings. <i>Jenkins, W. O., and Postman, L.</i>	69
The Role of Effort in the Performance of a Distance Discrimination. <i>Soloman, R. L.</i>	73
Discrete Movements in the Horizontal Plane as a Function of their Length and Direction. <i>Brown, J. S., and Slater-Hammel, A. T.</i>	84
Reaction-time as Related to Tensions in Muscles not Essential in the Reaction. <i>Meyer, H. D.</i>	96
Adaptation of the Muscular Tension Response to Gunfire. <i>Davis, R. C., and van Liere, D. W.</i>	114
An Analysis of the Unit of Measurement of the Galvanic Skin Response. <i>Lacey, O. L., and Siegel, P. S.</i>	122

J. GEN. PSYCHOL.

VOL. XL.	JANUARY, 1949.
A Study in the Reliability of Scoring the Rorschach Ink Blot Test. <i>Ramzy, I., and Pickard, P. M.</i>	3
An Experiment on Reading Character from Portraits. <i>Wilkie, J. S.</i>	11
Alterations in Pattern Vision Following Trauma of Occipital Lobes in Man. <i>Teuber, H-L., and Bender, M. B.</i>	37
Rorschach Checks on "False Positives" of the Cornell Selectee Index Records of Student Nurses. <i>Robin, A., and Geiser, E.</i>	59
Jung's Psychological Types. <i>Gray, H.</i>	63
Group Pre-training for Serial Role Learning by Means of a Moving Picture Technique. <i>Grant, D. A., et al.</i>	89
Some Considerations Concerning the Use of Statistics in Abnormal Psychology. <i>Webb, W. B.</i>	95
The American Optical Company's Compilation of Pseudoisochromatic Plates as a Means of Detecting and Analyzing Defective Color Vision. <i>Hardy, L. H., et al.</i>	103

J. GENET. PSYCHOL.

VOL. LXXIII.	DECEMBER, 1948.
Shirley's Babies after Fifteen Years. <i>Neilon, P.</i>	175
A Factor Study of a Test Battery at Different Educational Levels. <i>Chen, T.-Y. L., and Chow, A. H.</i>	187

The Effect of Discouragement on the Revised Stanford-Binet Scale. <i>Gordon, L. V., and Durea, M. A.</i>	201
Indeterminate Number Concepts. II. <i>Brotherton, D. A., et al.</i>	209
A Methodological Note on the "Controlled Diary" Technique. <i>Anastasi, A.</i>	237
A Study of Fear and Anger in College Students Through the Controlled Diary Technique. <i>Anastasi, A., et al.</i>	243
Intelligence Examinations in Peru with the Lima Revision of Terman's Group Test. <i>Blumenfeld, W.</i>	251

VOL. LXXIV.

MARCH, 1949.

Properties of Bi-directional Gradients at Subgoals. <i>Haselrud, G. M.</i>	3
An Exploratory Study of Color Discrimination of Children. <i>Synolds, D. L., and Pronko, N. H.</i>	17
A Study of the Linguistic Functioning of Children with Articulation and Reading Disabilities. <i>Yedmack, J. G.</i>	23
Adjustment Problems at Upper Extremes of Test "Intelligence." <i>Wells, F. L.</i>	61
The Effect on Subsequent Maze Learning Ability of Graded Amounts of Vitamin B ₁ in the Diet of Very Young Rats. <i>O'Neill, P. H.</i>	85
Social Facilitation of Feeding Behavior in Dogs. I. <i>Ross, S. and J. G.</i>	97
Studies in Delinquency. I. <i>Zakolski, F. C.</i>	109
Studies in Delinquency. II. <i>Zakolski, F. C.</i>	119
An Experiment in Pursuit of "Color Blindness." <i>Pronkho, N. H., et al.</i>	125

J. GERONT.

VOL. IV.

JANUARY, 1949.

Some Factors Affecting Vocabulary Size in Later Maturity. <i>Fox, C., and Birren, J. E.</i>	19
The Urinary Excretion of Neutral 17-Ketosteroids in Middle-aged and Old Men. <i>Kirk, E.</i>	34

J. NERV. MENT. DIS.

VOL. CVIII.

DECEMBER, 1948.

A Study of Fasciculations. <i>Teitelbaum, H. A., and Bird, H. W.</i>	455
A Study of the Relationship Between Constitutional Variations and Fundamental Psychotic Behavior Reactions. <i>Wittman, P., et al.</i>	470
*Self-inflicted Prefrontal Lobotomy. <i>Papez, J. W., and Smolen, E. M.</i>	477
Group Psychotherapy in a State Hospital. <i>Gray, W.</i>	485
Porencephaly in Institutional Epileptics. <i>Pigott, A. W., et al.</i>	496
Acute Porphyria. <i>Clark, E. E., et al.</i>	502
Diplopia due to Divergence Insufficiency. <i>McKinney, J. McD., et al.</i>	507

Self-Inflicted Prefrontal Lobotomy. A Case Report.

(1) A case is presented of a 63-year-old man who attempted suicide by shooting himself in the right temple with a revolver.

(2) After nine weeks of hospitalization he was admitted to the Columbus State Hospital because of the residuae of his injury.

(3) An attempt is made to deduce the reasons for the attempted suicide by an evaluation of the patient's personality difficulties and the cortical degenerative changes, both of which were related to the patient's chronic alcoholism.

(4) Neurologic findings were minimal, and could be related to the proximity of the path of the bullet to the middle frontal gyrus.

(5) The chief defects found were in the higher mental functions and resembled closely those found after prefrontal lobotomy. The course of the illness and the present status of the patient are described and correlated with those of a surgical prefrontal lobotomy.

(Authors' abstr.)

VOL. CIX.

JANUARY, 1949.

Disturbances of Dermatokinesthesia on Cerebral and Spinal Diseases. <i>Halpern, L.</i>	1
Hypno-Synthesis. <i>Conn, J. H.</i>	9

Neurological Syndromes in Typhus Fever. <i>Herman, E.</i>	25
The Successful Treatment of an Obsessive Compulsive Neurosis with Narcosynthesis Followed by Daily Electro-shocks. <i>Korson, S. M.</i>	37
*The EEG in Scleroderma. <i>Taylor, R. M., and Pacella, B. L.</i>	42
Rhythmic Palatopharyngeal Myoclonus. <i>Stern, W. W.</i>	48
Poliomyelitis. <i>Brown, J. R., and Baker, A. B.</i>	54

The Electroencephalogram in Scleroderma.

- (1) Fifty-six patients with scleroderma were found to have abnormal electroencephalograms in 84 per cent. of cases.
- (2) The abnormalities consisted mostly of "slow" patterns, 32 per cent. and convulsive patterns, 21 per cent.
- (3) The majority of the records were borderline or mild, fewer moderate and few severe.
- (4) The degree of abnormality was not related to the severity or extent of the sclerodermatous process or to its duration.
- (5) There is no general correlation between a unilateral predominance and the EEG abnormality and a unilateral or contralateral sclerodermatous process.
- (6) It is suggested that a decrease in the ionized calcium in the fluid environment of nervous tissue might be a factor in the EEG abnormality.

(Authors' abstr.)

FEBRUARY.

*Intensive Electroplexy. <i>Valentine, M.</i>	95
Pathogenesis of Progressive Cephalothoracic Lipodystrophy. <i>Ferré, L. B.</i>	113
Psychiatric and Social Implications of Contrasts Between Psychopathic Personality and Obsessive Compulsion Neurosis. <i>Michaels, J. J., and Porter, R. T.</i>	122
Combined Treatment of Symptomatic Paresis with Penicillin and Fever Produced by Continuous Intravenous Typhoid Vaccine. <i>Mahoney, V. P., and Hammerman, S.</i>	133
*Convulsive Therapies. <i>Martin, P. A.</i>	142
The Wechsler-Bellevue Scale and the Substitution Test as Aids in Neuropsychiatric Diagnosis. <i>Hewson, L. R.</i>	158

Intensive Electroplexy.

Electroplexy, used on an intensive schedule (once a day or more frequently), is qualitatively different in its therapeutic value and side effects from the orthodox course of more widely-spaced doses. It is the preferable technique in some conditions, giving a quicker initial response; and also may produce remissions in some patients who fail with orthodox courses, but in this case maintenance doses or further intensive treatment may be required, possibly until the natural term of the psychosis is terminated. Dramatic but frequently unstable remissions may be obtained in unpromising cases. The effect of intensive treatment in 21 cases is described.

With intensive ECT there appears to be a speeding up of the "cumulative phase" of electroplexy, and it is suggested that in some conditions treatment $\times 2$ - $\times 3$ /week is too infrequent to allow the therapeutic "cumulative phase" to occur.

There is some evidence suggesting that in recoverable cases the period of hospitalization may be shortened if intensive ECT is applicable; however, it is not usually possible to reduce the total number of necessary convulsions by using treatment intensively.

In the cases under review, intensive treatment was found of value (roughly in order of usefulness) in the following conditions:

- (1) Acute psychosis with refusal of food.
- (2) Acute mania.
- (3) The paranoid type of involutional psychosis.
- (4) Paranoid psychosis.

If ECT is to be used at all in patients demonstrating the above conditions, the primary use of the intensive method is recommended. Intensive therapy

may also be used (5) in reducing tension in some cases of chronic mental illness ; (6) in some atypical depressions. In schizophrenia it is of little permanent value.

No hard and fast rules can be laid down on the subject of spacing treatments, and adherence to any rigid schedule is deleterious ; the treatment of the individual case must be reviewed from day to day. With intensive methods, treatment may be initiated π 1/day or oftener according to the severity of the presenting symptoms, and continued until the gross features of the psychosis are broken up, after which the rate of giving treatment is reduced by half and continued until a fair degree of improvement is obtained ; it seems preferable to stop just short of producing severe amnesic-confusional symptoms. Treatment is then continued with spaced doses, and maintenance doses if required. The physical complications of ECT do not appear to be increased by its employment intensively. For reasons of time and distance, a late follow-up cannot be presented. (Author's abstr.)

MARCH.

- *Some Observations on Lobotomized Patients Based upon Routine Neurologic Examinations. *Rose, A. S.* 201
- *Experimental Production of Convulsive Seizures. *Anderson, C. L.* 210
- Verified Cerebral Aneurysm with Negative Arteriogram. *Alpers, B. J., and Ryan, J. J.* 220
- An Oculokinetic Test of Equilibratory Co-ordination Having Differential Diagnostic Use. *Meyers, R.* 226
- Inducing Anxiety as a Part of the Therapeutic Method. *Walker, E. F.* . . 233
- *Allergy and Psychoneuroses. *Metzger, F. C.* 240
- The Wechsler-Bellevue Scale and the Substitution Test as Aids in Neuropsychiatric Diagnosis. *Hewson, L. R.* 246

Some Observations on Lobotomized Patients Based Upon Routine Neurologic Examinations.

From observations based on routine neurologic examinations, it is concluded that prefrontal lobotomy induces in all cases regardless of the type of psychosis : (1) a period of marked reduction in spontaneous motor activity association with a short attention span and a poverty of mental content ; (2) a period of loss of automatic higher center control over reflex emptying of the urinary bladder ; (3) an excessive reactivity to stimuli of pain applied to the body surface, especially to the sole of the foot, which is possibly permanent. For a few days postoperatively there is generalized reduction in muscle tone. But otherwise, there is no disturbance in volitional movement, motor co-ordination or perception.

The explanations of these observations on lobotomized patients cannot be established with certainty. However, the similarity of the altered bladder function and reaction to pin pricks to that of normal children suggests that lobotomy interrupts the mechanism of acquired automatic control over these functions.

A pain stimulus applied to the sole of the foot of all individuals induces simultaneously the protective reflex of withdrawal and the perception of the stimulus. The average adult integrates the stimulus into his awareness of the situation and when the stimulus is a part of a medical examination the reaction of withdrawal of the affected limb may be completely inhibited. This inhibition of the basic reflex of withdrawal in the average adult is automatic, yet variable in degree, depending on the circumstances at the moment of the stimulus. The apparent inability of the lobotomized individual to inhibit the reaction of withdrawal makes it reasonable to conclude that the operation lobotomy interrupts nerve pathways involved in the function of control of some basic reflex patterns.

(Author's abstr.)

Experimental Production of Convulsive Seizures.

(1) Eight anesthetized adult rabbits (one male and one female from each of four litters) were given intracranial injections of 3 c.c. of equal parts of acetone and physiologic saline on alternative days.

(2) Each injection was followed by a convulsive seizure beginning from 5 to 15 seconds after the injection.

(3) Three animals exhibited convulsive seizures between injections.

- (4) Analysis by the ether extraction method to determine the possible solvent effect of acetone, indicated a mean brain dry weight of 16.025 gm. and a residue of 8.93 gm. with a mean fat content of 7.0925 gm.
- (5) A similar analysis of the brains of 4 controls gave a mean brain dry weight of 16.6725 gm. and a residue of 9.04 gm. with a mean fat content of 7.630 gm.
- (6) Statistical treatment indicated the difference in residue weight between the control and experimental group was not significant.
- (7) Statistical treatment indicated a significant difference in the fat content of the two groups.
- (8) The conclusion may tentatively be drawn that the convulsions following injections were due to the immediate fat solvent effect of the acetone.
- (9) The seizures occurring between injections may have been due to the reduced lipin and lipoid of the brain.
- (10) No significant difference was observed in the reactions of, or effect upon, male as against female animals.
- (11) Individual differences in the effect upon specific animals were observed but the basis of the difference was not determined. (Authors' abstr.)

Allergy and Psychoneuroses.

The clinical picture presented by the allergic individual is clouded by psychoneurotic manifestations in a great number of patients. Many reactions from medicines and hyposensitization treatments are on a fear basis, and not an allergic one. Many allergic seizures which cannot be explained on a basis of increased exposure to allergens can be explained on the basis of a complicating emotional experience. A neurosis complicating allergy requires recognition and treatment. (Author's abstr.)

J. NEUR. NEUROSURG. PSYCHIAT.

VOL. XII.	FEBRUARY, 1949.
Post-Ischemic Paraesthesiae. <i>Merrington, W. R., and Nathan, P. W.</i>	1
*Anticonvulsive Action of Paraldehyde. <i>de Elio, F. J., et al.</i>	19
*Syncope and Seizures. <i>Kershman, J.</i>	25
Intelligence of Patients with Friedreich's Ataxia. <i>Davies, D. L.</i>	34
Developmental Defects of the Cisterna Magna and Dura Mater. <i>Graeme-Robertson, E.</i>	39
Crushing Injuries to the Skull. <i>Russell, W. R., and Schiller, F.</i>	52
Platybasia. <i>Mayerszky, C.</i>	61
Virus Diseases of the CNS. <i>Gear, J.</i>	66

Anticonvulsive Action of Paraldehyde.

Paraldehyde is a substance with little toxicity that can be injected intravenously in doses of up to 0.2 c.c. per kg. without any ill-effects. Large doses have a narcotic action.

The motor responses of the cerebral cortex of the cat and human beings are greatly reduced or abolished by small doses of paraldehyde. The convulsive attacks produced in the course of neurosurgical operations by cortical stimulation are immediately stopped by paraldehyde.

Paraldehyde reduces or abolishes for some minutes the spontaneous cortical activity of the cat according to the dose employed. Convulsive discharges of the cortex elicited by leptazol disappear immediately with the injection of paraldehyde.

The anticonvulsive action is also very striking in animals injected with different convulsant drugs. A dose of paraldehyde protects an animal against large doses of strychnine and leptazol. The anticonvulsive action appears also in the decerebrate and spinal preparations. Clinically, paraldehyde has been used in many cases to stop operative or postoperative convulsions that in some cases may reach serious proportions.

The depressing action of paraldehyde has also been demonstrated on the peripheral neuromuscular junctions and on the ganglion synapses, although the action is more marked on the cerebral cortex.

The theoretical implications and mechanism of action of paraldehyde are briefly discussed. This substance is recommended in doses of 0.05 to 0.1 c.c.

per kg. intravenously as the best agent that we actually have to break and stop a convulsive discharge. The dose may be repeated if necessary.

(Authors' abstr.)

Syncope and Seizures.

1. One hundred and fourteen patients have been described having syncopal spells and episodes of transient dizziness, blurring of vision, "blackout," abdominal sensations, and weakness with or without loss of consciousness. No definite convulsions occurred in any of them although in one instance a seizure was produced during the hydration and pitressin test.

2. All these patients had pathological EEG records between spells, the commonest type of abnormality being a diffuse dysrhythmia (65 per cent.).

3. These spells were essentially the same as the vagal and vasovagal attacks described by Gowers, and the EEG disturbances indicate that they are fundamentally epileptic in character.

4. The form of the pathological EEG abnormality and the character of the spells suggest a subcortical and probably hypothalamic origin.

5. For this reason, and the fact that convulsive seizures do not occur, and also because of the personal and social stigmata attached to the diagnosis of epilepsy, the term "encephalosyncope" is suggested as a diagnosis for these patients. It is in effect a mild form of idiopathic epilepsy.

6. In several instances a focal abnormality in the temporal region can be isolated by the EEG and these patients have ictal automatisms. These are cases of focal cortical temporal lobe seizures.

7. The term "psychomotor discharges" is misleading when used to describe an EEG abnormality since so-called "psychomotor" attacks are not always associated with such discharges and vice versa. Attempts to correlate this pattern of EEG abnormality with clinical syndromes may lead to considerable confusion.

(Author's abstr.)

J. NEUROPATH. EX. NEUR.

VOL. VIII.

JANUARY, 1949.

Acute Necrotizing Hemorrhagic Encephalopathy. Adams, R. D., et al.	1
Asymptomatic Extrapyrarnidal Involvement in Pick's Disease. Winkelman, N. W., and Book, M. H.	30
Red Softening of the Brain. Fazio, C.	43
Prevention of the Experimental Allergic Encephalomyelitis. Ferraro, A., and Cazzullo, C. L.	61
Production of Chronic Allergic Encephalomyelitis in Guinea-pigs by the Intraperitoneal Route. Cazzullo, C. L., and Ferraro, A.	70
The Effect of Multiple Gliomas and Other Organic Changes of the Brain on the Cerebral Subarachnoid Space. Hassin, G. B., and Hilkewitch, B.	75
Carcinoma of the Breast and Intraspinal Meningioma. Freeman, D. H., et al.	85
Paresthesia in a Rhesus Monkey Associated with a Thalamic Lesion, etc. Whittier, J. R., et al.	93
The Efferent Intercortical Connection of the Superficial Cortex of the Temporal Lobe (Macaca mulatta). Petr, R., et al.	100

J. SPEECH AND HEARING DIS.

VOL. XIII.

DECEMBER, 1948.

A Physician's Account of his Own Aphasia. Rose, R. H.	294
A Magnetic Recorder on Wheels. Temple, W. J.	306
Personality Measurement in Speech Correction. Hawk, S. S.	307
Group Therapy for Adult Stutterers. Cypreansen, L.	313
Infant Speech. Irwin, O. C.	320
The Speech Correction Foundation. Johnson, W.	324
Environmental Factors in Relation to the Speech of Cerebral Palsied Children. Hood, P. N., et al.	325
Follow-up in the Correction of Functional Articulatory Disorders. Roe, V.	332
An Experimental Program for Hard of Hearing Children. Morley, D. E.	337

Should the Speech Therapist be a Voice Therapist. <i>Froeschels, E.</i> . . .	346
A Study of Certain Factors Presumed to be Associated with Reading and Speech Difficulties. <i>Ariley, A. S.</i> . . .	351
Audiometric Tests of Speech Defective College Students. <i>Hegarty, I. E., and Miller, V. R.</i> . . .	361
Parent Participation in Teaching Speech to the Deaf Child. <i>Lassman, G.</i> . .	366
A Description of the Speech Clinic at the Minneapolis Veterans' Hospital. <i>Welsh, A. M.</i>	372

VOL. XIV.

MARCH, 1949.

An Open Letter to the Mother of a Stuttering Child. <i>Johnson, W.</i> . . .	3
The Halstead-Wepman Aphasia Screening Test. <i>Halstead, W. C., and Wepman, J. M.</i>	9
The Intensity of Oral Responses to Stimulus Words. <i>Black, J. W.</i> . . .	16
Hoarseness and Voice Change in Male Adolescents. <i>Curry, E. T.</i> . . .	23
Auditory Deficiency and Academic Achievement. <i>Sprunt, J. W., and Finger, F. W.</i>	26
Auditory Acuity for Pure Tones in the Waking and Hypnotic States. <i>Schneck, J. M., and Knauf, V. H.</i>	33
Two Ways of Increasing the Clinical Usefulness of a Magnetic Tape Recorder. <i>Anderson, B. A., and Knauf, V. H.</i>	37
Organized Speech Therapy for Cleft Palate Rehabilitation. <i>Buck, McK., and Harrington, R.</i>	43
Notes on Organizing a Speech Correction Program in the Public Schools. <i>Houchin, T. D.</i>	53
Speech and Hearing Therapy in the Public Schools of Ohio. <i>Irwin, R. B.</i> . .	63

J. NEUROPHYSIOL.

VOL. XII.

JANUARY, 1949.

*Return of Sensation after Experimentally Produced Lesion in Sciatic Nerve of Cat. <i>Sherman, I. C., et al.</i>	1
*Acetylcholine and Convulsive Activity. <i>Hyde, J., et al.</i>	17
*Effects of Direct and Reflex Nerve Stimulation on the Exocrine Secretory Activity of the Pancreas. <i>Kuntz, A., and Richins, C. A.</i>	29
*Relationships Between Cerebral and Cerebellar Cortices in Cat. <i>Hampson, J. L.</i>	37
*Relation of Pain Sensory Threshold to Form of Mechanical Stimulator. <i>Bishop, G. H.</i>	51
*Actions of Anti-cholinesterases on Endplate Potential of Frog Muscle. <i>Eccles, J. C., and MacFarlane, W. V.</i>	59

Return of Sensation after Experimentally Produced Lesions in Sciatic Nerve of Cat.

The area of analgesia after section of the saphenous major, tibial, peroneal and sural nerves of the cat's leg have been described. The sensory supply of the whole sciatic nerve has been outlined and the extent of the loss was shown in accordance with the sural nerves involved.

The terminology of sensory loss and sensory regeneration is not well defined, and it is suggested that some uniformity be accepted. The anatomic sensory supply of a nerve should be considered to be that area represented by the loss of light touch immediately after section of that nerve. The area within the periphery of the anatomic sensory supply has preservation of pain as a result of dual innervation or intermediate zone. When other nerves adjacent to one left intact are severed, the area preserved sensibility is called the residual supply of the nerve.

When some time has elapsed after section of a nerve and the area of analgesia continues to shrink without regeneration, this shrinkage is due to overlap and is brought about by the ingrowth of fibers from adjacent nerves. In this area there is recovery of deep pin-prick whereas the area of loss of touch remains constant.

Finally, the area which remains completely insensitive to all cutaneous sensations whatever time may have elapsed without regeneration is called the area of isolated supply. Any recovery within this area can result only from regeneration.

We have outlined the area of potential nerve overlap for the sciatic nerve of the cat. As in man, large areas of return of sensibility to pain within the anatomic supply of a nerve occur as the result of overlap when regeneration is impossible. The rate and manner of this return is described.

The rate and the completeness of return of sensibility to pin-prick is described after primary and secondary sutures. The recovery of sensation due to regeneration, as opposed to the return of sensation due to overlap, is often characterized by large areas becoming imperfectly sensitive as contrasted to shrinkage of the area of analgesia. No correlation was found between the recovery of sensation and of motion. As in man, motor recovery may be well advanced and sensory recovery may not have begun. As in man, pressure pain returned before sensibility to deep pin-prick.

The placing reaction occurred before return of cutaneous sensibility and was related to motor recovery and probably deep sensibility, to which there is a greater overlap than to pain.

When a suture was delayed for 60 days after section of a nerve, recovery of sensation of deep pin-prick was markedly delayed both as to time of first evidence of recovery and completeness of recovery. Moreover, often there were long periods of delay between a certain degree of recovery and a later progression. Furthermore, in a number of cases no sensory recovery occurred. (Authors' abstr.)

Acetylcholine and Convulsive Activity.

An investigation of the effects of cholinesterase-inhibiting substances and a stable acetylcholine homologue on the convulsive activity of the cat's cerebral cortex yielded the following results:

1. Eserine administered intravenously or applied directly to the exposed cortex was found to facilitate the convulsive response to a series of widely different chemical substances. This facilitation was characterized by a more rapid onset of convulsive activity, more frequent convulsive spikes, the elicitation of spikes by the combined application of eserine and the convulsant substance when the latter was ineffective by itself, and the re-evocation of convulsive activity on application of eserine to a previously spiking area which had apparently recovered from the effect of the convulsant substance.

2. Intravenously injected prostigmine, like eserine, exerted a facilitating effect on convulsive activity in doses which were without significant effect on blood pressure or heart rate.

3. The parasympathomimetic choline ester mecholyl applied to the cortex in conjunction with convulsant substances augmented their effect in a way similar to that described above for eserine. These results are interpreted as indicating a significant role of acetylcholine in the processes underlying cortical convulsive activity.

4. Di-isopropyl fluorophosphate was without effect on convulsive activity whether administered intravenously or applied directly to the cortex. The possible causes of this unexpected result with DFP are still under investigation.

(Authors' abstr.)

Effects of Direct and Reflex Nerve Stimulation on the Exocrine Secretory Activity of Pancreas.

With the pancreatic duct cannulated the effects of direct and reflex nerve stimulation on the exocrine secretory activity of the pancreas have been observed. Faradic stimulation of the vagi or of the splanchnic nerves with the pancreatic nerves intact augmented the rate of secretion. Direct faradic stimulation of the celiac plexus before or after functional degeneration of the parasympathic pre-ganglionic fibers also increased the flow of pancreatic juice. This result persisted following depression of the adrenergic nerves with ergotoxine phosphate. The postganglionic nerve supply to the pancreas thus includes cholinergic fibers which increases the rate of flow of pancreatic juice. Stimulation of the celiac ganglia under similar conditions, but with paralysis of cholinergic fibers by atropine sulphate resulted in an inhibition of the flow of pancreatic fluid. The postganglionic sympathetic nerve supply of the pancreas must also contain adrenergic components which retard the rate of flow of pancreatic juice. Stimulation of mesenteric

nerves resulted in a marked decrease of pancreatic secretion. This effect was obtained when all nerves to the pancreas were intact and when the vagi and the splanchnic nerves had been functionally degenerated. In the latter case, however, it was less pronounced. With vagus and splanchnic nerves degenerated the effect persisted following transection of the jejunum but disappeared when the celiac ganglia were extirpated. Reflexes from the intestine to the pancreas may hence be mediated in part through the splanchnic nerves and reflex centers in the central nervous system, but reflex pathways from the intestine to the pancreas which do not traverse the central nervous system undoubtedly exist and involve synaptic connections in the celiac ganglia.

Since Richins demonstrated that the sympathetic nerve components in the pancreas of the cat pass only to blood vessels, the pancreatic secretory responses to splanchnic and mesenteric nerve stimulation can probably be best explained as a result of alterations of blood flow through the gland. (Authors' abstr.)

Relationships Between Cerebral and Cerebellar Cortices in Cat.

1. Electrical stimulation of a number of the specific functional areas of the cerebral cortex in the cat evokes responses in related regions of the contralateral cortex.

2. Stimulation of somatic area I (postcentral homologue) evokes responses confined largely to the contralateral anterior lobe and lobulus simplex. The face subdivision projects to the simplex and upper culmen while the arm and leg subdivision projects to the lower culmen and centralis respectively. The projection of the trunk area overlaps part of the urea to which the arm and leg areas project.

3. Stimulation of somatic area II evokes responses confined largely to the contralateral paramedian lobule. The evidence was suggestive of face representation in the more rostral folia with the arm and leg being more caudally situated.

4. Auditory areas I and II project to the folium vermis and tuber vermis in an overlapping pattern, with the auditory area II projection concentrated somewhat caudally.

5. The autonomic center for the eyes situated on the medial wall of the cerebral cortex is represented primarily in the contralateral cerebellar hemisphere, the upper folia of the adjacent paramedian lobule and the lateral arm of lobulus simplex.

6. Duality of representation exists in the cerebellar cortex as it does in the cerebral cortex. (Author's abstr.)

Relation of Pain Sensory Threshold to Form of Mechanical Stimulator.

Pain thresholds of individual pain spots at their points of highest sensitivity have been tested by probes of various forms. Spherical stimulators have the advantages that their curvature gives a simple measure of the skin indentation at threshold; that they do not penetrate the epithelium; and that over a considerable range of sizes, threshold is reached when approximately the lower hemispherical surface has been pressed into contact with the skin surface. Under these circumstances the plot of grams force per area of hemisphere, or per radius squared, gives approximately constant values of threshold over a considerable range of sizes. Deviations from constancy at either end of this range can be accounted for by simple mechanical factors whose effect is minimal in the constant range.

Over this range, it may be inferred that the constant factor of stimulation at threshold is lateral stretch of the subepithelial nerve net. Since fibers reaching the skin under each sensory focus turn horizontally into the net, lengthwise stretch of nerve terminals appears to be the effective stimulus for pain endings in mechanical distortion of the skin.

Other simple experiments and casual experiences agree with this inference to the extent of demonstrating that in the absence of inflammation, stretch is a most effective stimulus for skin pain endings. (Author's abstr.)

Actions of Anti-cholinesterases on Endplate Potential of Frog Muscle.

A systematic study has been made on the effects produced on the endplate potential (e.p.p.) of the curarized frog's sartorius by seven anti-cholinesterases.

All slow the time course of the e.p.p. set us by single or repetitive nerve volleys and increase the relative size (voltage) of the slowly decaying component.

Four criteria have been adopted in order to express graphically the concentration action relationship for these seven substances in respect both of the time course of the e.p.p. and of the relative size of the slowly-decaying component.

Each of the four criteria increases along a sigmoid curve when plotted against the negative logarithm of the prostigmine concentration, and this relationship also appears to hold with the other anti-cholinesterases.

For any one criterion there are wide divergences in the activities of the substances, prostigmine being the most effective and DFP usually the least. However, the relative activities assessed by the four criteria are in good agreement, a finding which is inherently probable, for all four criteria have been chosen because they are likely to assess anti-cholinesterase activity.

In contrast, the curare-like depressant action of all seven substances diverges widely from these assumed anti-cholinesterase activities.

By the above four criteria for testing anti-cholinesterase activity *in vivo*, the concentration for half effectiveness has to be much higher than with *in vitro* testing, but less so with prostigmine than with others. Presumably this discrepancy is attributable to the special type of cholinesterase at the frog's endplate.

The ACh hypothesis of neuro-muscular transmission is fully in accord with all the observations, which themselves throw light on the detailed mechanisms involved in this transmission—in particular the removal of ACh from the site of its action and the generation of the slow component of the endplate potential.

The concentration-action curves of prostigmine as determined *in vivo* are discussed in relationship to the concentration-inhibition curves for *in vitro* inhibition of ChE, and are shown to correspond to a monomolecular inhibitory action on an enzyme of low concentration. (Authors' abstr.)

MARCH.

- | | |
|--|-----|
| *Pattern of Tactile Representation in the Thalamus of the Cat. Mountcastle, V., and Henneman, E. | 85 |
| *Effect of Preoccipital and Temporal Decortication on Learned Visual Discrimination in Monkeys. Ades, H. W., and Raab, D. H. | 101 |
| *Irritability of Mammalian Nerve Following Ischemia. Porter, E. L., and Wharton, P. S. | 109 |
| *Study of Multiplied Cortical Responses to Repetitive Stimulation in the Thalamus. Fields, W. S., et al. | 117 |
| *Effect of Localized Cutaneous Stimulation on Circulation in Duodenal Arterioles and Capillary Beds. Richin, C. A., and Brizze, K. | 131 |
| *Effects of Barbiturates and Ether on Spontaneous Electrical Activity of Dog Brain. Swank, R. L., and Watson, C. W. | 137 |

Pattern of Tactile Representation in the Thalamus of the Cat.

1. Physiological excitation of cutaneous tactile receptors produces a localized potential change in the ventral nucleus of the cat's thalamus. This response is sufficiently characteristic to serve adequately as a means of mapping the pattern of tactile representation in the thalamus.

2. The responsive area in the thalamus is contained within but does not fill completely the pars externa arcuata of the ventral nuclear group.

3. The contralateral surface of the body is represented within this responsive area as a figure of the animal, with the tail pointed antero-laterally, face and mouth medially, the extremities inferiorly. The figure is distorted to allow greater volume representation of those parts of the body with the greatest innervation density. The dorsal midline portions of the body are represented in the continuity from nose to tail across the superior portions of the responsive area. Reversal of the representation of the cervical segments does not occur in the thalamus. An ipsilateral face area is present medial to points for mouth and contralateral face. No responses were recorded following stimulation of other parts of the ipsilateral body surface. (Authors' abstr.)

Effect of Precentral and Temporal Decortication on Learned Visual Discrimination in Monkeys.

1. Monkeys were trained in a visual form discrimination using a modified discrimination-box.

2. The discrimination habit was abolished by one-stage, bilateral extirpation of cortical areas 18 and 19, but was reacquired with postoperative retraining (monkey D-1).

3. With training trials presented between operations, serial destruction of areas 18 and 19 produces no habit-loss after either operation. Subsequent bitemporal decortication resulted in a postoperative amnesia which could not be overcome with prolonged retraining (monkey D-2).

4. The habit was retained following bitemporal decortication (monkey D-4) and was acquired initially in the absence of these (monkey D-3). Subsequent bilateral removal of areas 18 and 19 permanently abolished the form discrimination, although both animals readily learned a simple brightness-discrimination in the same apparatus. (Authors' abstr.)

Irritability of Mammalian Nerve Following Ischemia.

The peroneal nerve in the rat is cut and enclosed in a glass of electrode filled with Ringer's solution where it is stimulated by single shocks from an inductorium. The blood supply to the nerve is isolated at the knee, and the circulation in the nerve is observed through the glass.

Clamping the vessel results in a cessation of circulation in the nerve as observed through the glass electrode.

Cessation of circulation results (after a variable interval up to 7 min.) in an increase in irritability of the nerve as shown by increased contractions of the tibialis anticus muscle.

Removal of the clamp on the blood vessels at the height of contractions returns the nerve to the initial condition in an average of 2.5 minutes. The experiment may be immediately repeated when this occurs.

If the clamp on the blood vessel is not removed the nerve loses its irritability after an interval varying from 10 to 26 minutes. After returning the circulation to the nerve a recovery period of possibly up to an hour is necessary before the nerve responds again to the original stimulus. If it does not thus recover, an increase in the strength of the stimulus may permit the continuation of the experiment.

A good preparation may be used for hours for repeated demonstrations of the effect of ischemia. It is suggested that these observations may have a bearing on the question of ischemic pain. (Authors' abstr.)

Study of Multiplied Cortical Responses to Repetitive Stimulation in the Thalamus.

Repetitive stimulation of the lateral geniculate nucleus in the rabbit anaesthetized lightly with ether is likely to exaggerate the voltage of the fast deflections (specific responses) which occur in the cortex following stimulation in the thalamus, and to cause these waves to discharge spontaneously, independent of the stimulus sequence, and to continue to do so after stimulation ceases. Since a specific repetitive response of this magnitude so obscures the alpha waves as to appear to replace them, or may do so in fact, the multiplied response to the stimulus effectively constitutes the whole record.

In the authors' experience it is unlikely for after-discharge to occur in the post-stimulatory period unless preceded by multiplied response in the stimulatory phase. The maximal after-discharge follows when termination of stimulation occurs during the height of the response, in other words, the paroxysm initiated during stimulation merely continues into the post-stimulatory phase. The authors believe that the repetitive discharge of the specific response mechanism in paroxysms is assignable to the same neural elements as those which summate their activities to produce the strychnine spikes. Like that of strychnine, the paroxysmal reaction is readily blocked by ether and is prone to spread rather widely during the later phases of an experiment.

The experiments offer further proof for the existence of two functionally distinct but completely interrelated neural mechanisms of cortex generally. They indicate

that the paroxysmal discharges of which convulsive phenomena consist represent an abnormally intense activity disorder of the specific response mechanism and do not necessarily involve the alpha rhythm mechanism.

An alternative possibility is afforded for explaining multiple frequencies that occur transiently in the electroencephalogram during photic driving: these may represent spontaneous discharges in the specific response mechanism rather than on and off responses to successive flashes. (Authors' abstr.)

Effects of Localized Cutaneous Stimulation on Circulation in Duodenal Arterioles and Capillary Beds.

The vasomotor activity of the arterioles and capillary beds of the duodenum during cutaneous stimulation with warmth and cold was studied by employing quick freezing and subsequent fixation of tissues with the freezing-drying technique.

During cutaneous application of warmth the arterioles in the subserosa and submucosa of the duodenum were dilated, and the capillary beds in the villi were engorged with blood. During application of cold the corresponding arterioles were constricted, and the capillary beds were ischemic.

The most pronounced vasoconstriction was observed in the larger arterioles located within the subserosa, but blood flow in these vessels was rapid during vasoconstriction as well as during vasodilatation. Constriction of these vessels could not be considered of greatest importance in regulation of blood flow through the capillary beds since the more peripheral arterioles in the submucosa of the duodenum under these conditions contained a considerable amount of blood. The vasomotor activity in the arterioles of the submucosa seemed more significant in this regard. While the tonic changes in these vessels were not so great as in the larger arterioles of the subserosa, the blood flowed rapidly only during vasodilatation with warm cutaneous stimulation and was slowed during vasoconstriction with cutaneous application of cold. The blood in the lumina of the constricted arterioles was congested. The congested blood exerted a damming effect which prevented the passage of blood cells into the capillary beds. The plasma which trickled through appeared to wash the formed elements of the blood out of the capillary beds and into the venous circulation. No active capillary constriction seemed necessary. Vasoconstriction in the arterioles of the submucosa was a rigidly controlled response to reflex nerve stimulation and is probably the most important nervous response directly regulating blood flow through the capillary beds. Vasodilator reflexes were more loosely regulated and are probably due to inhibition of muscle contraction with more passive muscle response.

(Authors' abstr.)

Effects of Barbiturates and Ether on Spontaneous Electrical Activity of Dog Brain.

The spontaneous electrical activity of the cerebral hemispheres of normal dogs and the changes produced in it by ether and the barbiturate drugs have been studied. The following observations were made:

1. The dominant spontaneous electrical activity of the brains of unanesthetized dogs at a low level of excitation is about $25 \pm$ per sec. A variable amount of $12 \pm$ per sec. and $50 \pm$ per sec. activity is usually present, the former being marked posteriorly and the latter more marked anteriorly. With enhancement of the excitatory state of the animal state of the animal, the $50 \pm$ per sec. activity is observed in the posterior portions of the brain under this circumstance.

2. During ether anesthesia the electroencephalogram is dominated by $50 \pm$ per sec. activity. During the induction period this occurred first in the parietal cortex and then in the premotor area. The amplitude of the electrical oscillations increased in the parietal and premotor areas, while at the same time the amplitude of the brain waves of the motor cortex decreased. Significant slowing of the brain waves during ether anesthesia was not observed until the anesthesia had become very deep.

3. The induction of sodium amytal narcosis was characterized electrographically by the early disappearance of the $50 \pm$ per sec. oscillations, then the loss of the $25 \pm$ per sec. activity, and finally by the loss of the $12 \pm$ per sec. waves. In the deeper narcosis a gradual slowing of frequencies occurred. The amplitude and frequency of the electric activity was altered least in the motor area. A

characteristic of barbiturate narcosis was that periodically decreased spontaneous electrical activity was followed by bursts ("suppression-burst" phenomena).

This was manifested in light narcosis by the "barbiturate bursts," and in deep narcosis by the bursts alternating with "blackouts." It is suggested that these phenomena are related to metabolic changes in the nerve cells concerned with the recovery and excitation processes of the neuron, since the excitability of neurons to electrical stimuli during "blackouts" was regained so slowly.

4. Electrical threshold studies of the cerebral cortex suggested that sodium amytal narcosis depressed the motor strip less than any other area of cortex.

5. It is suggested that sodium amytal and ether exert a selective effect upon nerve cells, based upon their size. Sodium amytal first affects the smaller neurons and later the larger ones. Ether, on the other hand, appears to act first on the larger neurons, and later on the smaller ones. (Authors' abstr.)

J. NEUROSURG.

VOL. VI.

JANUARY, 1949.

Neurosurgery. Yesterday, To-day and To-morrow. <i>Penfield, W.</i>	13
Tantalum Cranioplasty. <i>Weiford, E. C., and Gardner, W. J.</i>	13
A Study of 211 Patients with Verified Glioblastoma Multiforme. <i>Davis, L., et al.</i>	33
Arterial Anomalies of the Spinal Cord. <i>Epstein, J. A., et al.</i>	45
The End-results of Surgery for Ruptured Lumbar Intervertebral Discs. <i>Spurling, R. G., and Grantham, E. G.</i>	57
*Selective Cortical Undercutting as a Means of Modifying and Studying Frontal Lobe Function in Man. <i>Scoville, W. B.</i>	65

Selective Cortical Undercutting As a Means of Modifying and Studying Frontal Lobe Function in Man. Preliminary Report of Forty-three Operative Cases.

1. Selective cortical undercutting constitutes a method of producing discrete cortical lesions in man without interference of the blood supply to adjacent areas of the brain.

2. Cortical undercutting is anatomically and surgically feasible and has certain technical advantages over cortical ablations, especially in speed, facility and preservation of blood supply.

3. A preliminary report is made of 43 cases of selective cortical undercutting of the frontal lobes.

4. The areas selected for undercutting have been areas 9 and 10 of Brodmann because of empiric success reported by others in the ablation or leucotomy of these areas, and the orbital and cingulate gyrus areas because of their known influence on the autonomic system and behavior of animals.

5. The operative technique is described, as well as a method of marking the undercut areas by wire loops.

6. The gross physiologic results have been largely of a negative nature.

7. The therapeutic results justify further investigation.

(Author's abstr.)

VOL. VI.

MARCH, 1949.

A Cervical and a Lumbar Pilonidal Sinus Communicating with Intraspinal Dermoids. <i>Sachs, E. J., and Horrax, G.</i>	97
A Follow-up Report of Spinal Cord Injuries in a Group of World War II Patients. <i>Schneider, R. J., et al.</i>	118
Subdural Empyema. <i>Keith, W. S.</i>	127
Physiological Salt Solution for Brain Surgery. <i>Elliott, K. A. C., and Jasper, H. H.</i>	140
Paraphysal Cysts of the Third Ventricle. <i>Greenwood, J., jun.</i>	153

J. PSYCHOL.

VOL. XXVII.

JANUARY, 1949.

The Attainment of Concepts. VII. <i>Heidbreder, E.</i>	3
Reversibility of Stimulus Function under Hypnosis. <i>Bowles, J. W., jun., and Pronko, N. H.</i>	41

A Study of Differential Stimulus Function in Hypnosis. <i>Pronko, N. H., and Hill, H.</i>	49
Students' Attitudes Toward Communists. I. <i>Schonbar, R. A.</i>	55
Recognition for Ego-involved Materials. <i>Tresselt, M. E., and Levy, B.</i>	73
Holistic Laws of Life. <i>Kempf, E. J.</i>	79
Clinical Psychology in Retrospect and Prospect. <i>Wells, F. L.</i>	125
Studies in Motivation and Retention. II. <i>Heyer, A. W., jun., and O'Kelly, L. I.</i>	143
Individual Differences in Colour Vision and their Measurement. <i>Pulford, R. W.</i>	153
Prevision of Stereoscopic Settings as Influenced by Distance of Target from a Fiducial Line. <i>Graham, C. H., et al.</i>	203
Stereoscopic Settings with Reticles Providing Multiple Reference Ranges. <i>Graham, C. H., et al.</i>	209
Phobias. <i>Crider, B.</i>	217
Visibility of Cathode-Ray Tube Screens. <i>Williams, S. B., and Hanes, R. M.</i>	231
An Investigation of the Relationship Between Four Criteria of Leadership Ability for Three Different Tasks. <i>Carter, L. F., and Nixon, M.</i>	245
The Attainment of Concepts: VIII. <i>Heidbreder, E.</i>	263
The Projective Expression of Needs. III. <i>McClelland, D. C., et al.</i>	311
"Direction" in Problem Solving. <i>Weaver, H. E., and Madden, E. H.</i>	331
On the Significance of the Psychogalvanic Response as an Indicator of Reaction to Personality Test Items. <i>Cofer, C. N., et al.</i>	347
Mental Ability of Prematurely Born Children at Early School Age. <i>Knehr, C. A., and Sobol, A.</i>	355
Toward a Scientific Morality. <i>Cantril, H.</i>	363
Ability, Perceptual, Personality and Interest Factors Associated with Different Criteria of Leadership. <i>Carter, L., and Nixon, M.</i>	377
Dimensions of Prejudice. <i>Kramer, B. M.</i>	389
Synonymity, Vividness, Familiarity and Association Value Ratings of 400 Pairs of Common Adjectives. <i>Haagen, C. H.</i>	453
The Relationship of Certain Personality Traits to Errors and Correct Responses in Several Types of Tasks Among College Women under Varying Test Conditions. <i>Staudt, V. M.</i>	465
Eyedness as Affecting Results Obtained with the Howard and Dolman Depth Perception Apparatus. <i>Scott, R. B., and Sumner, F. C.</i>	479
Sex Differences in Levels of Aspiration and in Self-estimates of Performance in a Classroom Situation. <i>Sumner, F. C., and Johnson, E. E.</i>	483
A Study of Malingering on the MMPI. <i>Cofer, C. N., et al.</i>	491

J. PSYCHOL. NORM. PATH.

VOL. XLI.	1948.
Work: a Form of Behaviour. <i>Meyerson, I.</i>	7
Travail: Evolution of a Word and an Idea. <i>Febvre, L.</i>	19
The Attitude Toward Work in Ancient Greece. <i>Aymard, A.</i>	29
Work in the Western Monastic Orders of the Fourth to the Ninth Century. <i>Delaruelle, E.</i>	51
Work and Theology: Marginal Notes of Proudhon. <i>Vignaux, P.</i>	65
Technics and Technology. <i>Mauss, M.</i>	71
Art and Science. <i>Lalande, A.</i>	79
Tradition and Innovation in Peasant Life. <i>Faucher, D.</i>	89
Technical Change as a Problem of Social Psychology. <i>Bloch, M.</i>	104
The Character of Modern Technology and its Effects. <i>Camichel, C.</i>	120
Outline of a Psycho-sociology of Belt-system Work. <i>Friedmann, G.</i>	127
The Laughable and the Comic. <i>Sourian, E.</i>	145
Remarks on Visual Expression. <i>Schuhl, P. M.</i>	184
Physical Reality and Linguistic Expression. <i>Mikus, F.</i>	194
Semantic Values and Grammatical Values. <i>Galichet, G.</i>	206
Blindness and Verbalism. <i>Henri, P.</i>	216

J. SOC. PSYCHOL.

VOL. XXVIII.

NOVEMBER, 1948.

- Motivational Aspects of Occupational Stratification. *Centers, R.* . . . 187
- The Construction and Partial Standardization of a Scale for Measuring Self-insight. *Gross, L.* . . . 219
- Variant Meanings of the Terms Conditioning and Conditioned Response. *Cowgill, D. O.* . . . 247
- Factors Contributing to Happiness Among Danish College Students. *Isager, H.* . . . 257
- A Note on the Security-Insecurity Test. *Gough, H. G.* . . . 257
- Control Interaction. *Smith, M.* . . . 263
- Emotional Traits in Pacifists. *Kelley, R. R., and Johnson, P. E.* . . . 275

VOL. XXIX.

FEBRUARY, 1949.

- Experiments in Psychotherapy. *Ruesch, J.* . . . 3
- The Selection and Training of Executives. *Blake, W. D., and Harriman, A. E.* . . . 29
- The Relation Between Childhood Environment and the Scholastic Aptitude and Intelligence of Adults. *Blake, R. B.* . . . 37
- Adolescent "Prestige Factors" in Relation to Scholastic and Socio-economic Variables. *Anastasi, A., and Miller, S.* . . . 43
- The Relation Between Loss of a Parent and Progress in Courtship. *Winch, R. F.* . . . 51
- Atomic Energy or the Atomic Bomb. *Kay, L. W., and Gillin, I. J.* . . . 57
- An Evaluation of the Bogardus Scale of Social Distance by the Method of Equal-Appearing Intervals. *Sartain, A. Q., and Bell, H.-V., jun.* . . . 85
- Family Size and Sibling Age, Sex and Position as Related to Certain Aspects of Adjustment. *Damrin, D. E.* . . . 93
- The Conditioning Technique Applied to a Public Opinion Problem. *Stagner, R., and Britton, R. H., jun.* . . . 103

OCCUP. THER. REHAB.

VOL. XXVII.

DECEMBER, 1948.

- Geriatric Rehabilitation. *Howell, T. H.* . . . 468
- Rehabilitation of Psychiatric Patients after Hospital Discharge. *Sivadon, P.* . . . 479

VOL. XXVIII.

FEBRUARY, 1949.

- The Value of Art in the Treatment of the Mentally Ill. *Pessin, J., and Friedman, I.* . . . 1
- Psychological Implications of Physical Medicine. *Hall, V. R.* . . . 21
- The Role of Educational Therapy in Rehabilitation. *Boyle, R. W.* . . . 31

MED. J. AUSTR.

VOL. XXXVI.

1949.

- The Nervous Child. *Hamilton, D. G.* . . . 41
- The Nervous Child. *Dawson, W. S.* . . . 43
- To-day's Problems of Mental Hospitals. *Stafford, B. F. R.* . . . 94
- Amnistration and Mental Invalidity. *Bostock, J.* . . . 96
- The Over-emphasis on Psychiatric Symptoms. *Minogue, S. J.* . . . 130
- Head Injuries in Civil Practice. *Lindon, L.* . . . 231
- Psychosomatic Aspects of General Medicine. *Love, H. R.* . . . 347
- Psychosomatic Aspects of Surgery. *Lee, A. E.* . . . 348
- Psychosomatic Aspects of Paediatrics. *Jackson, D.* . . . 349

MIND.

VOL. LVIII.

APRIL, 1949.

- Russell's Doubts about Induction. *Edwards, P.* . . . 141
- A Defence of "Synthetic Necessary Truth." *Toulmin, S.* . . . 164
- Determinables, Determinals and Determinants (II). *Prior, A. N.* . . . 178
- Economic Behaviour and Welfare. *Little, I. M. D.* . . . 195

NERV. CHILD.

VOL. VII.

OCTOBER, 1948.

Feeble-mindedness: Absolute, Relative and Apparent. <i>Karner, L.</i>	365
The Psychologist's Contribution to the Recognition of Pseudo-feeble-mindedness. <i>Waskowitz, C. H.</i>	398
The Role of Psychometry in the Differential Diagnosis of Some Forms of Pseudo-feeble-mindedness. <i>Altshuler, J. P.</i>	407
Social and Educational Impairment Wrongly Diagnosed as Feeble-mindedness. <i>Safran, D., and Harms, E.</i>	416
A Case of Pretended Stupidity. <i>Shools, N. E.</i>	421
The Pseudo-feeble-minded Child and Adolescent in Court. <i>Hartogs, R.</i>	425
The Relations Between Impaired Hearing and Pseudo-feeble-mindedness. <i>Hardy, W. G.</i>	432

NERVEN.

VOL. XVIII.

1947.

Comparative Psychopathological Experiences from the Two World Wars. <i>Bonhoeffer, K.</i>	I
The Significance of Feeling for the Experience-Structure. <i>Khün, H.</i>	5
Origination, Evolution, Transformation, Sublimation. <i>Gruhle, H. W.</i>	14
A Contribution to the Pathocharacterology of Organic Personality-changes. <i>Baeyer, W.</i>	21
The Psyche of the Spinal Cord Injured. <i>Schulze, W.</i>	28
Concerning Cochlear Amusia. <i>Kranz, H.</i>	35
Predisposition and Environment. <i>Gruhle, H. W.</i>	115
*When Cardiazol, When Electric Shock? <i>Kraus, P.</i>	163
Hopping Nystagmus. <i>Frenzel, H.</i>	205
On the Concept of Fore-Gestalt and its Significance for Brain Pathology. <i>Conrad, K.</i>	289
Partial Psychic Blindness after Occipital Brain-injury with Special Impairment of Physiognomy-Recognition. <i>Faust, C.</i>	294
Neurological and Psychic Disturbances in Hepatic Ailments. <i>Zillig, G.</i>	297
Symptomatic Psychoses of "Schizoform" Stamp in the Train of Uremia. <i>Thiele, R.</i>	313
Psychological Investigations on Brain-injured. <i>Busemann, A.</i>	337
*Smell and Taste Disturbances after Head Injuries. <i>Bay, E.</i>	350
On the Perception of Body Space and Movement Through the Skin. <i>Strache, J.</i>	433
Organic Illness and Neurosis. <i>Göppert, H.</i>	437
*The Paranoid Schizophrenias. <i>Kleist, K.</i>	481, 544
The Significance of the Diencephalon in Impulsively Driven States of Adolescents. <i>Pipkorn, U.</i>	505
Introduction to a Discussion on Shock Therapy. <i>Schneider, K.</i>	529
*On Taste-disturbances in Brain-injured and the Anosmia-ageusia Syndrome. <i>Faber, W., and Jung, R.</i>	530

When Cardiazol, When Electric Shock?

Cardiazol treatment by reason of the modification by Emma (simultaneous injection of cardiazol and grape sugar) has become again capable of competing with electro-shock treatment. The differences in the effectiveness of chemical and physical convulsive treatments are to be sure not great. In severe excitement-states of catatonic and hebephrenic stamp, even in non-organically conditioned states of confusion, cardiazol is found by the author to be the more positively and more intensively acting means. In paranoid and hallucinatory forms of schizophrenia, but particularly in dementia simplex, differences in the effectiveness of the two convulsive methods are less striking. Acute catatonia demands cardiazol treatment in massive form. Also in many depressions cardiazol treatment shows a greater effectiveness.

F. C. SUMNER (Psychol. Abstr.)

Smell and Taste Disturbances After Head Injuries.

The literature is reviewed and cases are presented bearing on smell and taste disturbances after head injuries. Smell disturbances occur quite frequently after head injuries. They consist in unilateral or bilateral hyposmia or anosmia which may be bound with spontaneous parosmias. They are conditioned by tearing of the fila olfactoria or by lesion of the bulbi or tractus olfactorii. Traumatic injuries to the central part of olfactory area (hippocampus formation) occur much more rarely and probably only in the case of penetrating brain injuries (shot wounds). They lead not to anosmia but to epileptic attacks of the uncinatus-type and to genuine olfactory hallucinations. Taste disturbances after head injuries, in so far as peripherally conditioned, are not (or only exceptionally) of organic origin. They are accompanying phenomena of an aromatic anosmia and owe their existence to a psychologically conditioned extension of the smell disturbance to the whole oral sense, which is grounded in the close synaesthesia of the chemical senses.

F. C. SUMNER (Psychol. Abstr.)

On Taste Disturbances in Brain-Injured and the Anosmia-ageusia Syndrome.

Among 300 open brain wound cases (brain shot) in whom an exact investigation of taste sensitivity was undertaken there were found 6 with positive central taste disturbances as follows: 1 bilateral ageusia, 1 bilateral parageusia (bitter monogeusia), 4 hemigeusias. Among 500 closed brain wound cases (contusio cerebri) there were 7 bilateral central taste disturbances. The bilateral ageusias are always bound with anosmia while the unilateral ageusias have no, or only slight, smell disturbances. The author believes, on the basis of neurological and Roentgen findings, that the traumatic ageusia-anosmia is caused by hemorrhages in the wall of the 3rd ventricle and not, as elsewhere assumed, by contusions of the cortical taste centers.

F. C. SUMNER (Psychol. Abstr.)

The Paranoid Schizophrenias.

The author concludes a study of paranoid schizophrenias in actual cases and in the literature with the following observations: (1) that catatonic schizophrenias are about double the frequency of paranoid schizophrenias; (2) that among his paranoids the preponderance of women is considerable (36.3 per cent. men and 63.7 per cent. women) while among his catatonics women were somewhat less numerous than men; (3) that typical, combined and atypical forms are to be distinguished among paranoids as well as among catatonics; (4) that the course in paranoid ailments is preponderantly chronic steadily progressive in 72.6 per cent., with remissions being considerably less than among catatonics; (5) that the age of paranoids (averaging 37.3) is essentially higher than that of catatonics (averaging 25.3); (6) that hereditary taint is, on the whole, weaker in paranoids than in catatonics; (7) that the general diagnosis of "paranoid schizophrenia" was reached with greater positiveness than that of "catatonic schizophrenia."

F. C. SUMNER (Psychol. Abstr.)

PROC. ROY. SOC. MED.

VOL. XLII.	MARCH, 1949.
Discussion on Streptomycin in Meningitis	155
Gross Morbid Anatomy of the CNS of Cases of Tuberculous Meningitis Treated with Streptomycin. Daniel, P. M.	169

PSYCHIAT.

VOL. XI.	NOVEMBER, 1948.
Special Logic of Schizophrenic and Other Types of Autistic Thought. Arieti, S.	325
Notes on an Experiment in International Multiprofessional Co-operation. Querido, A.	349
Multidisciplinary Methods in Retrospect. O'Doherty, E. F.	355
Speech Disturbances. Baker, S. J.	359
Mental Hygiene in Industry. Line, W.	367
Psychiatry, Education and the Unesco "Tensions Project." Sullivan, H. S.	371
Tough and Easy Cultures. Arsenian, J. and J. M.	377
Magical Fright. Gillin, J.	387

PSYCHIAT. QUART.

VOL. XXII.

JULY, 1948.

Sublimation and Aggression. <i>Hart, H. H.</i>	389
*Electric Shock During Pregnancy. <i>Doan, D. I., and Huston, P. E.</i>	413
A Preliminary Report of the Value of Pentothal Sodium as a Prognostic Aid in 40 Mental Patients. <i>Barbara, D. A.</i>	418
Attitudes and Opinions Concerning Mental Illness. <i>Ramsey, G. V., and Scipp, M.</i>	428
Tuberculosis in a State Hospital. <i>Pleasure, H.</i>	445
Sleep Paralysis. <i>Schneck, J. M.</i>	462
Psychogenic and Organic Determinants and their Education with Dyskinesias. <i>Siegal, L. J.</i>	470
Further Studies on Beating Fantasies. <i>Bergler, E.</i>	480
Post-traumatic Syndrome. <i>Karlan, S. C., and Heller, E.</i>	487
A Statistical Study of Patients in the New York Civil State Hospitals. <i>Malzberg, B.</i>	495
Out-Patient Treatment of Pre-psychotic and Post-psychotic Veterans in a Mental Hygiene Clinic. <i>Nussbaum, K., and Chaven, S.</i>	516
Combat Psychiatry in an Infantry Division. <i>Swatt, T. P.</i>	536
Father Time. <i>Meerlo, A. M.</i>	587
Subcoma Insulin Therapy. <i>Tomlinson, P. J.</i>	609
Psychodrama Combined with Insulin in the Treatment of Psychoses. <i>Moreno, J. L., and Schwartz, M.</i>	621
A Note on "Manner of Approach" in the Rorschach Test as a Measure of Psychic Energy. <i>Linn, L.</i>	634
Fictions in Domestic Relationships. <i>Eliasberg, W. G.</i>	638
Clinical Psychology in the State Hospital. <i>Landis, C., and Kinder, E.</i>	641
The Psychological Function of the Proper Name in the Reconstruction of the Personality of a Schizophrenic. <i>Duss, L.</i>	646
Neurosyphilis. <i>Weiss, I. I.</i>	667
Psychology of Reputation in Neurotics. <i>Bergler, E.</i>	680
On Various Uses of the Recorded Interview in Psychotherapy. <i>Freed, H.</i>	685
Psychodynamic Factors in Narcolepsy and Cataplexy. <i>Coodley, A.</i>	696
Folie à Deux. <i>Kibzey, A. T.</i>	718
The Use of Histamine in Preparing Patients for Psychotherapy. <i>Niver, E. O.</i>	729

Electric Shock During Pregnancy.

Herewith are added seven cases to the nine already reported by others, in which electric shock treatment alone has been used during pregnancy. The seven patients reported here all received curare to soften the convulsions. One was treated in the first trimester, four in the second and two in the third. In all cases the pregnancy was not complicated by the treatment, and uneventful delivery of normal infants was accomplished at term. On the basis of this experience, and the reports in the literature, it would seem that pregnancy *per se* is not a contraindication to electric shock therapy. From the writers' experience it also appears that curare may be used with safety. (Authors' abstr.)

PSYCHOANAL. QUART.

VOL. XVII.

OCTOBER, 1948.

Depersonalization and the Body Ego with Special Reference to the Genital Representation. <i>Berman, L.</i>	433
The Equivalents of Matricide. <i>Lindner, R. M.</i>	453
The Thread of Life. <i>Roheim, G.</i>	471
Prince Hal's Conflict. <i>Kris, E.</i>	487
Spirituality and Beauty in Artistic Experience. <i>Lee, H. B.</i>	507
The Nature of Reality, the Meaning of Nothing, etc. <i>Lewin, B. D.</i>	524
Transference in Borderline Neuroses. <i>Stern, A.</i>	527
On the Meaning of Losing Teeth in Dreams. <i>Lorand, S.</i>	529

VOL. XVIII.

1949.

A Case of Pathological Jealousy. <i>Barag, G.</i>	1
The Passing of the Gentleman. <i>Evans, W. N.</i>	19
A Neglected Boundary of Psychoanalysis. <i>Wittels, F.</i>	44
Schreber's Delusion of the End of the World. <i>Katan, M.</i>	60
Observations on a Primary Form of Anhedonia. <i>Glauber, I. P.</i>	67
Anal Sensations and Feelings of Persecutions. <i>Arlow, J. A.</i>	79

PSYCHOL. BULL.

VOL. XLVI.

JANUARY, 1949.

Infant Care and Personality. <i>Orlansky, H.</i>	1
The Prevost-Fechner-Benham Subjective Colors. <i>Cohen, J., and Gordon, D. A.</i>	97
An Extension of Control Group Design. <i>Solomon, R. L.</i>	137
Animal Hypnosis. <i>Gilman, T., and Marcuse, F. L.</i>	151

PSYCHOL. REV.

VOL. LVI.

JANUARY, 1949.

A Note on Frustration-Aggression Theories of Dollard and His Associates. <i>Morlan, G. K.</i>	1
The Application of Operational Analysis to Human Motor Behavior. <i>Ellison, D. G.</i>	9
The Function of the Frontal Cortex. <i>Stanley, W. C., and Jaynes, J.</i>	18
Factual Issues in the "Continuity" Controversy. <i>Blum, R. A. and J. S.</i>	33
The Formation of Learning Sets. <i>Harlow, H. F.</i>	51

VOL. LVI.

MARCH, 1949.

Stimulus Intensity Dynamism (V) and Stimulus Generalization. <i>Hall, G. L.</i>	67
Behavior Oscillation and the Growth of Preference. <i>Taylor, J. C.</i>	77
Motivation, Perception and Attitude Change. <i>Hastorf, A. H., and Knutson, A. L.</i>	88
Some Psychological Implications of Cortical Suppressor Areas. <i>Jones, F. N.</i>	95
Food-seeking Drive, Affective Process and Learning. <i>Young, P. H.</i>	98

PSYCHOSOM. MED.

VOL. X.

NOVEMBER-DECEMBER, 1948.

Psychodynamic Mechanism in Neuro-dermatitis. <i>Miller, M. L.</i>	309
Brain Wave Patterns Accompanying Changes in Sleep and Wakefulness During Hypnosis. <i>Barker, W., and Burgwin, S.</i>	317
Life Situations and Serum Antibody Titers. <i>Bakke, J. L., and Wolff, H. G.</i>	327
Diarrhoea. <i>Sperling, M.</i>	331
Peripheral Vasomotor Reactions as Indices of Basic Emotional Tension and Lability. <i>Theron, P. A.</i>	335
The Diagnostic Value of Peripheral Vasomotor Reactions in the Psychoneuroses. <i>van der Merwe, A. B.</i>	347
Erasistratus, Antiochus and Psychosomatic Medicine. <i>Seguin, C. A.</i>	355
Personality Factors in Allergic Nasal Disorders, etc. <i>Mitchell, J. H., et al.</i>	357
Audiometry Under Hypnosis. <i>Schneek, J. M.</i>	361
Emotional Factors and Tuberculosis. <i>Berle, B. B.</i>	366

VOL. XI.

JANUARY-FEBRUARY, 1949.

Emotional Factors in the Etiology of Hyperthyroidism. <i>Lidz, T.</i>	2
*Physiologic Studies of Reaction to Stress in Anxiety and Early Schizophrenia. <i>Malmo, R. B., and Shagass, C.</i>	9
Psychological Study of Symptom Mechanisms in Psychiatric Patients under Stress. <i>Malmo, R. B., and Shagass, C.</i>	25
*Effect of Chronic Fear on the Gastric Secretion of HCl in Dogs. <i>Mahl, G. F.</i>	30

Reaction to Stress in Anxiety and Early Schizophrenia.

1. An unselected population of 75 patients was divided into three groups: (A) 36 patients in whom anxiety was the predominant symptom; (B) all other patients, except early schizophrenics ($N = 28$), and (C) 11 early schizophrenics. Eleven normal control subjects were employed in order to provide a base line.

2. A standardized series of pain stimulations were presented by a Hardy-Wolff stimulator. Physiologic recordings were taken continuously throughout the test. Quantitative data obtained from analysis of records were compared with the clinical status of the case.

3. The results and major conclusions may be summarized as follows: (A) in general, severity of anxiety appeared to be related to degree of physiologic disturbance; (B) the clearest correspondence between degree of anxiety and degree of physiologic disturbance under stress was found with measurements reflecting striate muscle activity such as finger movement and neck muscle potentials; (C) in general, the more severe the anxiety, the greater was the over-reaction to pain stimulation; (D) in terms of general level of responsiveness, the early schizophrenic group resembled the most anxious group more than any other. But in two quite different types of reaction, the schizophrenic group showed a relative lack of discrimination among the various intensities. This poor discrimination appeared to reflect (at a simple level) the inappropriateness of response, which is generally typical of schizophrenia. (Authors' abstr.)

Effect of Chronic Fear on the Gastric Secretion of HCl in Dogs.

1. A review of the literature concerned with specific psychologic processes involved in the etiology of peptic ulcer revealed a confusing array of contrasting proposals resulting from personality studies of ulcer patients. Of these proposals, that which emphasized the primary role of chronic fear or anxiety appeared to be the best substantiated one.

2. Experimental evidence shows that vagal discharge and associated increased gastric acidity plays a primary role in the physiologic mechanism of ulcer formation.

3. From the foregoing, one would predict a positive relation between chronic fear behaviour and gastric acidity. This prediction was not adequately supported experimentally and it is contradictory to Cannon's hypothesis that increased sympathetic discharge is associated with inhibited parasympathetic discharge in the emotional response of fear.

4. This study was performed to obtain direct experimental evidence relevant to these two hypotheses: (a) during a state of chronic fear behaviour, the acidity of the gastric contents is higher than during normal behaviour; (b) if persistent fear behaviour occurs over an extended period of time, peptic ulcers will develop. It was also desirable to measure gastric emptying rate, heart rate, and behavioural changes under these two conditions of behaviour.

5. A modified conditioning procedure was used to develop a state of chronic fear in 7 dogs. Behavioural observations revealed that 6 of these dogs developed chronic fear behaviour and at the same time showed increased gastric acidity, gastric emptying rate, non-resting heart rate, and increased variability of both non-resting and resting heart rates. The dog who failed to develop chronic fear behaviour was the only exception to this pattern of autonomic changes. Removal of the animals from the experimental environment or omission of the reinforcing pain stimulus resulted in recovery of these behavioural, gastric and cardiac changes. Evidence showed that increased acidity occurs during conditioned fear in the absence of the primary experience of pain. No sexual difference was found in the acid response to the induction of chronic fear.

6. Gross and histologic examination of the stomach and duodenum of each dog showed no signs of tissue pathology in any case.

7. The implication of these results for the problem of ulceration in humans was discussed. In addition, they indicated that the direct extension of Cannon's hypothesis to chronic emotional states, which are of basic importance in psychosomatic disorders, is not justified. (Author's abstr.)

Q. J. STUD. ALC.

VOL. IX.	DECEMBER, 1948.
Alcohol Tolerance in Individuals with Chronic Producer-Gas Intoxication. <i>Ejercer, K., and Goldberg, L.</i>	329
The Motivational Pattern of Drinking. <i>Reley, J. W., jun., et al.</i>	353
The Importance of the Co-operation of Physicians in the Attack on Alcoholism. <i>Höjer, J. A.</i>	363
Proposals of the Swedish Government Committee for Reform of the Care of Inebriates. <i>Wihlund, D.</i>	372
Ancient Experience with Intoxicating Drinks. <i>McKinlay, A. P.</i>	388
Report on the Twenty-third International Congress on Alcoholism. <i>Lolli, G., and Mann, M.</i>	415

MARCH.

	1949.
The Treatment of Methanol Poisoning with Ethanol. <i>Aigner, K., et al.</i>	515
Changing Concepts in Alcoholism and its Management. <i>Kersten, P. M.</i>	523
One Aspect of Causation in Alcoholism. <i>Bird, B.</i>	532
Collaboration Between Government and Private Initiative in the Fight Against Alcoholism in Switzerland and Other Countries. <i>Steiger, V. J.</i>	544
Patterns of State Taxation of Distilled Spirits. <i>Traylor, O. F.</i>	556
Alcoholics Anonymous, in Melbourne, Australia. <i>Wilding, D. J.</i>	609

REV. NEUROL.

VOL. LXXX.	SEPTEMBER-OCTOBER, 1948.
Elementary Phenomena of the EEG Examined in the Light of the Physiology of Electric Organs. <i>Fessard, A.</i>	569
Physiopathological Aspects of Cortical Oxygen. <i>Rémond, A.</i>	579
Tubercular Meningitis and Streptomycin EEG Control. <i>Euziere, J., et al.</i>	589
EEG Study of Lesions of the Base of the Brain. <i>Fauve, J., et al.</i>	596

NOVEMBER.

Neurosurgical Experiences in Hereditary Optic Atrophy. <i>Verbiest, H.</i>	657
Lesion of the Lysian Body with Destruction of the Red Nucleus of the Same Side Without Hemiballismus. <i>Nicolesco, J. and T.</i>	677
Senile Myeloses. <i>Austregesilo, A.</i>	683

REV. PSICOL. GEN. APLIC.

VOL. III.	1948.
Scientific Patterns and Human Ethics. <i>Allport, G. W.</i>	425
The Institute of the Humanities. <i>Ortega, J., et al.</i>	449
Psychological Study of a Case of Kleptomania. <i>Guera, A., and Lang, T.</i>	469

RIV. PSICOL.

VOL. XLIV.	JULY-SEPTEMBER, 1948.
Examination of a Series of Intelligence Tests. <i>Gozzano, M.</i>	113
The Psychology of Twins. <i>Gedda, L.</i>	125
The Estimation of Intelligence of Young Italian Girls by Valentine's Test. <i>Falorni, M. L.</i>	132
Imaginative Activity in the Interpretation of Rorschach Pictures. <i>Bacci, V.</i>	142

RORSCHACH R. EXCH.

VOL. XII.	1948.
Personality Factors Involved in Student Concentration on Creative Painting and Commercial Art. <i>Anderson, I., and Munroe, R.</i>	141
The Use of the MAPS Test with Disturbed Adolescents. <i>Joel, W.</i>	155
Rorschach Signs for the Diagnosis of Organic Pathology. <i>Hughes, R. M.</i>	165
Involuntary Psychosis with Alcoholism. <i>Glik, E. E.</i>	168
The Use of Projective Techniques in Industry. <i>Steiner, M. E.</i>	171

SAMIKSA.

VOL. I.

1947.

The Genesis of the Superego. Jones, E.	3
The Story of the Light that Disappeared. Roheim, G.	51
Psychoanalytical Interpretation of Animal Behaviour. Bose, G.	209
The Psychology of Man's Attitude Towards Woman. Daly, C. D.	231
Symbolism in the Drawing of a Transvestite. Grotjahn, M.	241
Psychological Testings. Rapaport, D.	245
Nature of Paranoid Delusions. Chatterji, N. N.	263

STUD. PSYCHOL. PSYCHIAT., CATH. UNIV. AM.

VOL. VII.

1948.

A Comparative Study of a Seminary Group and Four Other Groups on the MMPI. Bier, W. C.	No. xi
--	--------

1. Biochemistry, Pathology, Physiology, etc.

Amylase of Blood and of Cerebrospinal Fluid in Heine-Medin Disease. Caltabiano, G. B. [*Riv. pediat. siciliana*, **1**, 197-200 (1946).]

In 15 children with poliomyelitis (aged 7 months-4 years) 40-160 and 2.5-10 units of amylase were found, respectively, in blood and cerebrospinal fluid.

C. SCANDURA (Chem. Abstr.)

Fluorescence of Cerebrospinal Fluid of Children with Various Diseases. Cacioppo, Filippo. [*Riv. pediat. siciliana*, **2**, 27-8 (1947).]

The study included 19 cases of various non-nervous diseases (I), 90 cases of diseases affecting the nervous system (II), and 68 cases of tubercular meningitis (III). Exposed to Wood's light spinal fluids from (I) and (II) gave no fluorescence, while those from (III) gave a blue fluorescence, even though the disease was in an early stage and other diagnostic means were of no value. Only in 2 cases of blue fluorescence was (III) not confirmed by bacteriological and clinical examination. Cacioppo believes the fluorescence is due to the thiochrome formed by oxidation of aneurine which is much increased during this disease.

C. SCANDURA (Chem. Abstr.)

The Histamine Content of Spinal Fluid with Special Consideration of Dementia Praecox. Trabucchi, Cherubino. [*Riv. patol. nervosa e mentale*, **49**, 131-61 (1941).]

Histamine can be determined in spinal fluid without extraction by the method of Barsoum and Gaddum (*C. A.*, **29**, 8042¹). The influence of acetylcholine is eliminated with atropine. Adenosine compounds exert on isolated guinea-pig intestine a relaxing effect and callicrein would have no effect at the concentrations employed. Histamine in the spinal fluid of normal persons and of schizophrenics of various types was always less than 0.17 per c.c. Histamine does not seem to play a role in schizophrenic pathology.

A. E. MEYER (Chem. Abstr.)

Amylolytic Power of Blood and of Cerebrospinal Fluid in Children. Caltabiano, G. B. [*Riv. pediat. siciliana*, **1**, 195-7 (1946).]

Experiments on 20 children showed no relation between the diastasic power of the cerebrospinal fluid and their age. Fluids of babies a few months old contain amylases. There is no relation between amylase content of the blood and of the cerebrospinal fluid. No increase of the diastasic content was found in 3 cases of tubercular meningitis.

C. SCANDURA (Chem. Abstr.)

Cerebrospinal Fluid of Healthy Children After Subarachnoid Injection of Nicotinic Acid. Zangri, G., and Lanza, A. [*Riv. pediat. siciliana*, **1**, 330-4 (1946).]

Data are tabulated on the cerebrospinal fluid (including contents of albumin, reducing substances, chlorides, etc.) of 20 children after injection of 20-30 mg. Na nicotinate (I) or 100 mg. nicotinamide (II). The spinal fluid became normal after

4-7 days and 2-3 days after the injection of (I) and (II) respectively. A second injection, 5-8 days after the first, had but little effect on the spinal fluid.

C. SCANDURA (Chem. Abstr.).

Organic Phosphoric Esters in Normal and Pathological Cerebrospinal Fluids. Huszák, István (Tudományegyetemi Agykutató Intézet, Szeged, Hung.). [Orvosok Lapja Népegészségügy, **3**, 961-2 (1947).]

No phosphoric acid esters hydrolyzable by acids or alkalies could be detected in cerebrospinal fluid.

ISTVÁN FINÁLY (Chem. Abstr.).

Acetylcholine in the Cerebrospinal Fluid of Mental Patients. Coloma, T. Alcober (Inst. med. expil., Valencia, Spain). [Trabajos inst. nacl. cienc. med. (Madrid) **3**, 359-66 (1943-44).]

Acetylcholine (I) in the cerebrospinal fluid of 32 mental patients was determined by Corsten's method (C. A., **35**, 3278²). No (I) was found in one-third of the cases, most frequently in epilepsy, less frequently in hebephrenia; (I) was always present in catatony. Some samples produced relaxation of lung preparations instead of contraction. Also repetition of the irrigation with the same preparation caused relaxation instead of contraction.

F. FROMM (Chem. Abstr.).

Cholinesterase Activity in Normal and Febrile Rabbit Brain. Peiss, C. N., Field, John, and Hall, Victor E. [Am. J. Physiol., **155**, 56-9 (1948).]

Whole homogenate from normal and febrile rabbit brains hydrolyzes, respectively, 9.07 and 8.81 mg. of acetylcholine per 100 mg. fresh tissue per hour. These values are the means of 12 determinations. The difference between these means is not significant. The supernatant fraction of similar homogenates hydrolyzes respectively, 3.52 and 3.51 mg. acetylcholine per 100 mg. fresh tissue per hour (mean of 12 determinations each). The results suggest that quantitative changes in cholinesterase assay are not associated with the thermostatic reset which occurs in fever.

E. D. WALTER (Chem. Abstr.).

Distribution of the Two Fractions of Cholinesterase in Homogenates of Portions of the Dog Brain. Little, J. Maxwell. [Am. J. Physiol., **155**, 60-3 (1948); cf. C. A., **43**, 297d.]

The $Q_A\text{-}C_h$ values (mg. of acetylcholine hydrolyzed/100 mg. wet weight/60 minutes) for various portions of the dog brain are as follows: caudate nucleus 33.6, cerebellar cortex 9.7, cerebellar medulla 8.3, cerebellar peduncle 6.4, medulla 5.6, thalamus 5.3, spinal cord 3.6, internal capsule 2.6, white matter 0.93, corpus callosum 0. In general, there is a direct relationship between the estimated relative mass of nerve fiber in the tissue and the activity of the supernatant fluid fraction of cholinesterase. With the exception of the corpus callosum, this relationship is suggestive that the supernatant fluid fraction may be more highly concentrated in the nerve fiber.

E. D. WALTER (Chem. Abstr.).

Vitamin Inhibitors of Cholinesterase. (II) Action of Vitamin K on Serum Cholinesterase In Vitro and In Vivo. Salvi, P., and Chiro, G. Di. [Acta neurol. (Naples), **2**, 485-8 (1947).]

Vitamin K inhibits (70.3 per cent. for concentrations of 0.2 per cent.) the cholinesterase of blood serum. The intravenous injection of vitamin K (10 mg.) decreases the cholinesterase content of blood.

(III) *Nicotinic Acid and Cholinesterase of Blood Serum In Vitro and In Vivo.* Salvi, P., and Morelli, A. [Ibid., 986-91.]

Nicotinic acid (I) inhibits (29.5 per cent. for concentrations of 0.3 per cent.) the cholinesterase of blood serum. The intravenous injection of 30 mg. (I) decreases the blood content of cholinesterase.

(IV) *Bile Salts, Serum Cholinesterase, and Sympathic-Para-Sympathic Equilibrium.* [Ibid., 991-7.]

Na taurocholate and Na glycocholate *in vitro* inhibit (76.2 and 46.5 per cent., respectively for concentrations of 0.01 M) serum cholinesterase. Na dehydrocholate (1.2 g. intravenously injected) decreases the cholinesterase content of blood serum.

C. SCANDURA (Chem. Abstr.).

The Concentration of Some Sulfonamide Compounds in the Blood and Spinal Fluid in Infancy. Sartori, Ernesto. [Boll. soc. med.-chir. Pavia, **55**, 811-18 (1941).]

Albucid, administered during 24 hours at a total dosage of 0.3 g. per kg., reaches higher concentrations in blood and spinal fluid of infants and in shorter time than is the case with sulfapyridine given in equal amounts. Albucid is eliminated in 8 hours, sulfapyridine in 24.

A. E. MEYER (Chem. Abstr.).

Grigorescu's Reaction for Globulins in the Spinal Fluid. Matilla, V., and Garrido, J. Aparicio. (Inst. med. exptl., Madrid). [Trabagos inst. nac. cienc. med. (Madrid) **2**, 257-64 (1943-44).]

The reaction consists in the appearance of turbidity at the surface of contact between 0.5 c.c. of spinal fluid with superimposed 95 per cent. EtOH. The method is equally as sensitive and reliable as other methods. It does not give false positive readings in case of contamination with small quantities of blood.

A. E. MEYER (Chem. Abstr.).

Colloid Reaction Investigations on Spinal Fluid. Szécsey, Gyorgy (Tudományegyetemi II, sz. Belklinika, Budapest, Hungary). [Orvosi Hetilap, **89**, 268-72 (1948).]

Samples of cerebrospinal fluid were tested (1) according to Guillain by the ben-zoin test; (2) by the mastic test proposed by Emanuel, Kafka, Cutting and Stanton; (3) by the paraffin test according to Kafka; and (4) by the shellac test proposed by Urechia-Danetz with the modification that the reagent was prepared according to Marchionini. Investigation of 50 different fluids proved that (1) gave best results and made possible a reliable distinguishment between meningitis and lues reaction types.

ISTVÁN FINÁLY (Chem. Abstr.).

Ultraviolet Light Absorption of Spinal Fluid Ultrafiltrates from Schizophrenics. Duensing, Friedrich (Univ. Gottingen, Ger.). [Nervenarzt, **18**, 277-9 (1947).]

Absorption curves were measured between 240 and 289 mμ in spinal fluid ultrafiltrates from 15 schizophrenics and, as controls, 5 psychopaths. There was considerable variation in the curves and no consistent differences were found, except that the schizophrenic fluids tended to give a smaller absorption. Duensing concludes that abnormal substances, detectable by this method, are not present in the spinal fluid in schizophrenia.

WARREN M. SPERRY (Chem. Abstr.).

Protein Content and Wassermann Reaction in Cerebrospinal Fluid. Rizzo, Cristoforo (Univ. Messina, Italy). [Riv. patol. nervosa e mentale, **68**, 49-57 (1947).]

The smallest protein content of cerebrospinal fluid in order that the Wassermann reaction be positive should be 0.0168-0.0170 g. per cent. The maximum normal protein content is 0.0165 g. per cent.

C. SCANDURA (Chem. Abstr.).

Blood Cholesterol Level in Hypophysealencephalitic Conditions. Zondek, H., Leszynsky, H., and Wolfsohn, Gerda. (Biccur-Cholim Hosp., Jerusalem). [Schweiz. med. Wochschr., **78**, 746 (1948).]

A high blood cholesterol level is found in disease of the hypophysis (240-460 mg. per cent.) in a great percentage of the cases examined. It is assumed that regulation of the cholesterol level is subject to the status of the hypophysis.

E. MAIER (Chem. Abstr.).

Comparison of Transients in Inorganic Systems With Those in Plant and Nerve Cells. Bartlett, James H. [J. Cellular Comp. Physiol., **32**, 1-29 (1948).]

In the Lillie passive iron-wire model of nerve, overshoot of potential does not occur as it does in nerve during the transition from the active to the passive state. Current vs. time curves in *Valonia*, *Halicystis* and *Nitella* have the same qualitative nature as those in electrolytic cells such as $\text{FeH}_2\text{SO}_4\text{H}_2(\text{Pt})$. The inductance discovered in squid nerve is essentially an electric parameter necessary for des-

cribing the overshoot which is attributed to 2 or more coupled reactions. If a nerve surface is regarded as analogous to a "rusty" sieve, subthreshold effects would be governed by leakage of ions through the sieve, and propagation of an impulse would be associated with removal of a closely adhering layer from the sieve itself.

H. L. MASON (Chem. Abstr.)

Action of Some Quaternary Ammonium Derivatives on Neuromuscular Transmission. Huidobro, F. [Bol. soc. biol. Santiago, Chile, 5, 6-10 (1948).]

Choline 1, Girard-P 0.1-1, and Girard-T 0.5 per cent. were tested on cats anesthetized with nembutal. The compounds increased the action of KCl and of acetylcholine, opposed that of curare, and intensified that of prostigmine. Choline was effective in denervated muscles also.

H. L. WILLIAMS (Chem. Abstr.)

Carbamate Conduction Block in Frog Nerve Fibers. Crescitelli, Frederick. [Am. J. Physiol., 155, 82-91 (1948).]

Certain features in the blocking action of ethyl, propyl, butyl and amyl carbamate are described. These esters block selectively the different fibers of the bullfrog sciatic nerve. Evidence for the existence of a period of heightened susceptibility to block by carbamate was noted after the washing out of a previously added carbamate and the complete recovery of ability to conduct.

E. D. WALTER (Chem. Abstr.)

Action of Caffeine and Bromides in Weakened and Well-established Conditional Reflex Polypnea. Popova, T. V. (Fiziol. Zhur. [J. Physiol., 34, 549-54 (1948).]

Administration of 0.1 g. caffeine (in milk) to dogs prolonged a conditioned polypnea from 3-7 minutes to 20 minutes. Administration of NaBr leads to extinction of conditioned reflex action only at 1.5 g. NaBr (9 kg. dog), and the extinction is not stable as a rule. This indicates that the action of bromide is not limited to the respiratory center, but depends on the functional state of cerebral cortex. Caffeine acts as an analeptic and is capable of enhancing the conditional reflex polypnea, weakened by prolonged action of the stimulus.

G. M. KOSOLAPOFF (Chem. Abstr.)

Histidine in the Urine of Mental Patients. Capaccioli, Pietro. [Rass. studi psichiat., 37, 202-8 (1948).]

By the Hinslers and Laszlo method histidine was determined in the urine of normal persons and of patients with common diseases and with mental diseases. Histidine was always present but quantitative differences were not significant.

C. SCANDURA (Chem. Abstr.)

Influence of Insulin-shock Therapy on Protein Metabolism and Elimination of Chlorides in Schizophrenia. Cortesi, Maria C. [Rass. studi psichiat., 35, 79-103 (1946).]

In 11 patients with schizophrenia subjected to insulin-shock therapy for 1, 2 and 4 months and to unchanged diet, the daily urinary elimination of urea was determined by the Kowarsky method, chlorides, by the Strauss method, and in some cases, phosphatides and creatinine were determined. In 66 per cent. of the cases a decrease of the N excretion was noted, in 33 per cent. an increase. Both effects persisted also after the treatment. Chloride elimination was slightly increased in 50 per cent. of the cases and decreased in the others.

C. SCANDURA (Chem. Abstr.)

The Ammonia and Glutamine Content of the Brain. Richter, Derek, and Dawson, Rex M. C. [J. Biol. Chem., 176, 1199-1210 (1948).]

The normal NH_3 (I) content of the rat brain was 0.28 mg. per cent. and the glutamine (II) content was 79 mg. per cent. The (I) level was decreased by prolonged nembutal narcosis and markedly increased by direct stimulation of the brain or by procedures which increased cerebral irritability. The (I) level was increased to 0.47 mg. per cent. by picrotoxin administration and to 0.81 mg. per

cent. by anoxia. Electric stimulation caused a rapid increase in the (I) level in 1-2 sec. and it was also raised by the stimulus of decapitation. The brain (I) was not affected by emotional excitement and the (II) content was not significantly affected by any of the factors which were tested. Injections of NH_4Cl in the rat caused convulsions when the brain (I) had risen to 9 mg. per cent. In conditions such as epilepsy, in which the brain is abnormally irritable, the toxic action of (I) may play a significant part.

H. O. S. (Chem. Abstr.).

Detection of Scorbatic and Rachitic Changes in Pigeon by Measurement of Chronaxia. Lecoq, Raoul, Chauchard, Paul, and Mazoué, Henrietta. [Compt. rend., **222**, 685-7 (1946).]

Adult pigeons made deficient in either vitamin C or D (by avitaminous diets or diets producing alkalosis), show an increased chronaxia for peripheral nerve followed by a decreased muscle chronaxia. These changes reach a maximum value at which they remain, by the 8th day of avitaminosis. The neuromuscular disturbances produced by alkalosis yield only to vitamin feeding, there is no synthesis of vitamins by the birds.

B. A. (Chem. Abstr.).

Chronaximetric Investigation of Anaphylactic Shock. Chauchard, Paul, Mazoué, Henriette, and Lecoq, Raoul. [Compt. rend. soc. biol., **142**, 889-90 (1948).]

During non-fatal anaphylactic (horse serum) shock in guinea-pigs and rats the peripheral chronaxia shows first a decrease, then, about 30 minutes after the shock injection, a large increase. Atropine prevents the first phase and antergan prevents the second phase; the 2 drugs together prevent all changes in chronaxia. It seems probable that at first acetylcholine, then later histamine, are involved in the shock reaction.

L. E. GILSON (Chem. Abstr.).

Nucleic Acid in Nerve-Cell Regeneration. Bodian, David (Johns Hopkins Univ., Baltimore, Md.). [Symposia Soc. Exptl. Biol. I, Nucleic Acid, 163-78 (1947); cf. C. A., **41**, 3855d.]

The cytoplasmic nucleic acid function in normal and regenerating metabolism of nerve cells was examined. Regressive changes in neurons follow disturbances such as those induced by chemical agents, toxins, virus activity, etc. Under some conditions these disturbances may lead to death of the cell. It appears that the Nissl substance (I) (nucleoprotein aggregate) is the most sensitive morphological indicator of regressive changes in that it shows the first changes, which are in the direction of reduction in quantity. Reduction in (I) is apparent within 24 hours after axon section, and the reduction proceeds for a period of one week, during which time the protein structure of (I), and the basophilic component disappear in the central part of the cell body. A decrease in absorption at 2804 Å. reflects these changes. Recovery changes are evident within 2 weeks after section. In chromatolytic cytoplasm a decrease in extinction coefficients occurred at 2652 and 2804 Å., paralleling morphological changes in (I). The nucleo-protein changes in cellular body cytoplasm which occur during regression and regeneration seem to be associated with adjustment of the steady state of the nerve cell to the initial decrease of cell volume and subsequent growth requirements of the regenerating axon. Enzymic changes during chromatolysis indicate that the acid phosphatase activity is doubled during axon regeneration, as compared with normal nerve. Ten to 14 days after sciatic nerve section acid phosphatase activity is 6 times normal, such increase being attributed to the proliferation of Schwann cells. Tests using anterior horn cells reveal an average 40 per cent. decrease of phosphocreatine in regenerating anterior gray when compared to normal gray of the opposite side. The values for inorganic P were high, owing to hydrolysis of acid-hydrolyzable phosphate during the determination. This resulted in low adenosinetriphosphate values which are not considered to be significant. Likewise the difference in inorganic phosphate of normal and regenerating anterior gray is not significant. The decrease encountered in creatine phosphate in regenerating neurons suggests an increased usage of creatine phosphate. It is postulated that the disturbance of molecule arrangements in the complex nucleoprotein aggregate (Nissl body) is an important factor in induced virus resistance in nerve cells. The changes observed towards embryonic levels, with subsequent return to adult levels as

regeneration is completed. Both developing and regenerating neurons have low levels of cytochrome oxidase activity, low levels of cytoplasmic nucleo-protein, high phosphate turnover, and increased demands for protoplasmic synthesis.

JOHN P. CRISPELL (Chem. Abstr.).

Does Glutamic Acid have any Effect on Learning? Stellar, Eliot, and McElroy, Wm. D. (Johns Hopkins Univ., Baltimore, Md.). [Science, **108**, 281-3 (1948).]

The maze-learning ability of pigmented rats of the Johns Hopkins colony (descendants of the Lashley strain) was not improved by the feeding of 200 mg. of L(+) - glutamic acid per day. These results do not confirm those of Zimmerman and Ross (C. A., **38**, 4688⁶) who used albino rats of the Sherman strain, although the same procedures were followed in all other details.

FRED. H. SNYDER (Chem. Abstr.).

Role of Peroxide in Oxidations in Nerve Tissues. Huszák, István (Univ. Szeged, Hung.). [Orvosok Lapja és Népegészségügy, **2**, 1245-8 (1946).]

In cats the catalase quotients found were for red corpuscles 6000, liver 2700, kidneys 800, lungs 600, spleen 550, heart muscle 400, gastrocnemius 400, gray substance of brain 60, white substance of brain 40. In cat-brain tissue heavy metal ions catalyzed oxygen absorption. In horse brain fatty acids absorbed no O in presence of heavy metal salts or metal salts and H₂O₂. The fraction containing unsaturated acids could easily be oxidized by heavy-metal ions. H₂O₂ probably forms hydroxy acids, which are easier to oxidize. The low catalase content of brains is tentatively attributed to the fact that nerve tissue contains much unsaturated acid, for the oxidation of which peroxide formed during other biological processes is readily available.

ISTVÁN FINÁLY (Chem. Abstr.).

Wheat Gluten as a Convulsant. Erickson, T. C., Gilson, W. E., Elvehjem, C. A., and Newell, G. W. (Univ. Wisconsin, Madison). [Proc. Assoc. Research Nervous Mental Disease, **26**, 164-74 (1947); cf. C. A., **41**, 5183g.]

WARREN M. SPERRY (Chem. Abstr.).

An Experiment on Human Vitamin B₆ Deprivation. Hawkins, W. W., and Barsky, James (Univ. Saskatchewan, Can.). [Science, **108**, 284-6 (1948).]

An adult male consumed a purified diet, without added pyridoxine, for about 2 months. Albuminuria was observed on the 12th day and persisted during 7 days of pyridoxine feeding (10 mg./day) and for some time on an ordinary diet. An unusual degree of depression and mental confusion, which occurred on the basal diet, disappeared after pyridoxine supplementation. An alteration in the proportions of lymphocytes and neutrophils was corrected by pyridoxine feeding.

FRED. H. SNYDER (Chem. Abstr.).

Effect of Thiamine Deficiency on Western Equine Encephalitis in Mice. Kearney, E. B., Pond, W. L., Plass, B. A., Maddy, K. H., Elvehjem, C. A., and Clark, P. F. (Univ. of Wisconsin, Madison). [J. Infectious Diseases, **82**, 177-86 (1948); cf. C. A., **42**, 2343h.]

When Swiss mice were inoculated with western equine encephalitis virus after severe signs of thiamine deficiency were evident the majority of 450 animals failed to show characteristic signs of infection. Such mice showed only weakness progressing to atonia, tremors, and difficulty in maintaining balance or in righting themselves. Mice on optimum diet died early. Inoculated thiamine deficient mice died earlier than uninoculated deficient mice. Mice on the deficient diet, when inoculated before the deficiency was marked, showed characteristic signs of infection, as did those receiving 30 or 60 µg. of thiamine per 100 g. of diet. It appears that thiamine deficiency does not prevent multiplication of the western equine encephalitis virus in the brains of mice, nor the production of characteristic brain lesions, but does modify the clinical responses to the virus-induced pathology.

JULIAN H. LEWIS (Chem. Abstr.).

Disturbances of Neuromuscular Excitability During Alimentary Imbalance and Avitaminoses. XX. Relation Between Vitamin Needs and Certain Amino Acids. Lecog, Raoul, Chauchard, Paul, and Mazoue, Henriette. [Bull. soc. chim. biol., **29**, 705-16 (1947); cf. C. A., **42**, 650d. See C. A., **42**, 2000i.]

XXI. *Action of Vitamin P on the Neuromuscular Symptoms of Scurvy.* [Ibid., 717-23. See C. A., **41**, 4837c.]

XXII. *Lack of Essential Fat Acids (Avitaminosis F) in Rat and Pigeon.* [Ibid., 724-8. See C. A., **42**, 970i.]

XXIII. *Vitamins and Amino Acid Metabolism.* [Ibid., 981-8. See C. A., **42**, 3040i.]

XXIV. *Vitamins and Fat Metabolism.* [Ibid., 989-98.]

In rats, the subcutaneous injection of small amounts of ordinary fats, or the feeding of large amounts in the diet, does not increase any vitamin requirement. The subcutaneous injection of castor oil, or Na stearate, oleate, or linoleate, or the feeding of any one of these in sufficient quantity to produce dietary imbalance, produces a disturbance of neuromuscular chronaxia and an encephalomedullary hyper-excitability which can be prevented or cured by oral administration of either nicotinamide, pantothenic acid, or pyridoxine. L. E. GILSON (Chem. Abstr.).

Effect of Convulsive Activity of Brain upon its Carbohydrate Metabolism. Olsen, Norman S., and Klein, J. Raymond (Univ. Illinois, Chicago). [Proc. Assoc. Research Nervous Mental Disease, **26**, 118-30 (1947); cf. C. A., **41**, 3854f, 3870g, 6977b.] WARREN M. SPERRY (Chem. Abstr.).

Studies of the Relation Between Electrolyte of the Cerebral Cortex and Mechanism of Convulsions. Colfer, Harry F. (Mayo Foundation, Rochester, Minn.). [Proc. Assoc. Research Nervous Mental Disease, **26**, 98-117 (1947); cf. C. A., **41**, 6344g.]

Slices of cerebral cortical tissue from rabbits were incubated for 1 hour in rabbit serum adjusted to a pH of 5.4, 6.6, 7.4, 8.0 or 9.7. The slices were then micro-incinerated and subjected to crystallographic analysis. At pH values below 7.4 there was a large loss of intraneural and a much smaller loss of intercellular electrolyte. At pH values above 7.4 there was a large increase in intracellular electrolyte with no change in the intercellular phase. The changes were reversible. The effect of increased pH was similar in all respects to that produced *in vivo* by induced convulsions. Daily injection of 1 mg. desoxycorticosterone acetate protected rats against convulsions induced by a loud, high-pitched sound and produced changes in the micro-incineration pattern opposite to those caused by induced convulsions. A low-K diet also exerted a protective effect against audiogenic convulsions. WARREN M. SPERRY (Chem. Abstr.).

A Comparison of the Influence of 2,4-Dinitrophenol on the Oxygen Consumption of Rat Brain Slices and Homogenates. Peiss, Clarence Norman, and Field, John (Stanford Univ. School of Med., Calif.). [J. Biol. Chem., **175**, 49-56 (1948).]

The respiration of rat cerebral cortex slices is stimulated by 2,4-dinitrophenol (I) in concentrations between 4.46×10^{-6} and 8.92×10^{-5} M. and depressed by higher concentrations. (I) inhibits O. consumption of reinforced brain homogenates (cf. Reiner, C. A., **41**, 5593c), the effect increasing with concentration. The O. consumption of untreated homogenate is about equal to the maximum observed in brain slices stimulated by (I). The data support the view that the increase in cell respiration produced by (I) depends on the inhibition of a "brake" or regulating enzyme. FRED. H. SNYDER (Chem. Abstr.).

Effect of Motor and Sympathetic Nerve Impulses on the Adrenaline-dehydroadrenaline System. Utevskii, A. M., and Butom, M. L. (Ukrainian Inst. Exptl. Endocrinol., Kharkov). [Biokhimiya, **13**, 346-50 (1948); cf. C. A., **42**, 3039h.]

Part of the adrenaline found in tissues is in an oxidized quinone form, which can be reduced to adrenaline. The reduction of the oxidized to the active hormone

form can be accomplished by the introduction of ascorbic acid into animals which do not synthesize vitamin C. Nerve impulses are also capable of producing the active hormone from its oxidized form. Thus, the electric stimulation of the sciatic nerve of the gastrocnemius muscle of a frog's leg leads to the complete disappearance of the dehydroadrenaline, with a simultaneous increase of adrenaline. On stimulating the sympathetic fibers, a complete reduction to adrenaline also follows. Furthermore, the adrenaline content is now greater than that of the control, which indicates that some adrenaline was mobilized from other sources, possibly by the liberation from protein-adrenaline complexes.

H. PRIESTLY (Chem. Abstr.).

Physiology of Neuromuscular Junctions; Chemical Aspects. Acheson, Geo. H. (Univ. of Cincinnati, Cincinnati, O.). [*Federation Proc.*, **7**, 447-57 (1948).]

The chemical transmission of nerve impulses at the endplate is discussed.

L. E. GILSON (Chem. Abstr.).

Stimulating Action of Phosphate Compounds on the Perfused Superior Cervical Ganglion of the Cat. Feldberg, W., and Hebb, Catherine (Univ. Cambridge, Eng.). [*J. Physiol. (London)*, **107**, 210-21 (1948).]

Adenosinetriphosphate, creatine phosphate, yeast and muscle adenylic acid and the Na salts of tri-, pyro- and orthophosphoric acids have a powerful stimulating action on the perfused superior cervical ganglion as well as on the denervated ganglion after degeneration of its preganglionic fibers. Creatine and adenosin are without effect. The stimulating effect is abolished by very high concentration of eserine but not by curare. The effect is analogous to that of K and citrate.

H. L. WILLIAMS (Chem. Abstr.).

Some Effects of Nicotine-like Substances and their Relation to Sensory Nerve Endings.

Brown, G. L., and Gray, J. A. B. (Natl. Inst. Med. Research, Hampstead, London). [*J. Physiol. (London)*, **107**, 306-17 (1948).]

Dogs and cats anesthetized with nembutal or chloralose and decerebrate cats under ether received arterial injections of nicotine and acetylcholine into the skin or mesentery. Centripetal discharge of impulses in the nerves supplying the injected area was observed. The response was not abolished by atropine nor elicited by acetyl- β -methylcholine or histamine. Large doses of nicotine or acetylcholine after eserine abolished the sensitivity of the preparation to subsequent doses but not to mechanical stimuli.

H. L. WILLIAMS (Chem. Abstr.).

Effect of Diisopropyl Fluorophosphonate on Neuromuscular Transmission in Cats.

Brown, G. L., Burns, B. Delisle, and Feldberg, W. (Natl. Inst. Med. Research, Hampstead, London). [*J. Physiol. (London)*, **107**, 346-54 (1948).]

Diisopropyl fluorophosphonate behaves similarly to eserine in decerebrate cats. Arterial injection of 100-200 γ /2-3 k/g. cat causes an increase of tension response of the tibialis anterior to single maximal motor nerve volleys. Intravenously larger doses, 10 mg./kg., are required. The material has a greater affinity for pseudo- than true cholinesterase.

H. L. WILLIAMS (Chem. Abstr.).

Cerebral Concussion and Convulsive Reactivity. Spiegel, E. A., Spiegel-Adolph, M.,

Wycis, H. T., and Marks, M. (Temple Univ., Philadelphia, Pa.). [*Proc. Assoc. Research Nervous Mental Disease*, **26**, 84-97 (1947).]

Generalized metrazole (I) convulsions were abolished in rats by a concussive blow to the head, and the sensitivity to electrically induced convulsions was usually decreased in rats and cats by concussion. Various biochemical explanations were tested. Atropine in doses able to counteract an effect of acetylcholine did not influence the action of concussion on (I) convulsions. Concussion can occur without change in cerebral lactic acid, phosphocreatine, or adenosinetriphosphate concentrations and without effect on O. uptake of brain tissue *in vitro*. In 37 patients who had sustained a cerebral concussion and in concussed animals the cerebrospinal fluid showed an ultra-violet absorption band with a peak at about 2650 Å.,

significantly higher than in normal controls, and not accounted for by blood or an abnormal protein concentration. Enzymes able to split nucleic acid were demonstrated in cerebrospinal fluids from concussed patients and animals.

WARREN M. SPERRY (Chem. Abstr.).

Brain Volume, Diameter of the Blood Vessels in the Pia Mater, and Intracranial Pressure in Acute Carbon Monoxide Poisoning. Sjostrand Torgny (Caroline Hosp., Stockholm, Sweden). [*Acta Physiol. Scand.*, **15**, 351-61 (1948).]

The diameter of the blood vessels in the pia mater increases during absorption of CO, the brain swells, and intracranial pressure rises. This probably explains the headache accompanying CO poisoning.

S. MORGULIS (Chem. Abstr.).

A Historical Note on the Discovery of the Synapses in the Autonomic Nervous System with the Help of Nicotine. Heubner, Wolfgang. [*Arch. expil. Path. Pharmacol.*, **204**, 33-5 (1947); *Chem. Zentr.*, 1947, **1**, 769.]

M. G. MOORE (Chem. Abstr.).

Electrical Activity of the Spinal Cord in Ether and Pentothal Anesthesia. Horsten, G. P. M. (Univ. Amsterdam, Netherlands). [*Arch. intern. pharmacodynamie*, **77**, 212-18 (1948).]

In cats under pentothal, rapid frequencies are superimposed on the slow ones, while under ether the rapid frequencies are much less in evidence. If the cord is cut in the cervical region, the electric activity is the same under ether or pentothal, i.e. both produce a predominance of slow frequencies.

M. L. C. BERNHEIM (Chem. Abstr.).

Cerebral Blood Flow in Epilepsy. Gibbs, Erna L., Gibbs, Frederic A., Hayne, Robert, and Maxwell, Harry (Univ. Illinois, Chicago). [*Proc. Assoc. Research Nervous Mental Disease*, **26**, 131-40 (1947).]

A method for the determination of cerebral blood flow is described. Inject a 0.2 per cent. solution of Evans blue (I) at a constant and known rate into the carotid artery and determine the concentration of (I) in blood from the jugular vein. Six epileptic patients, during periods between seizures, did not differ from 6 non-epileptic patients in the rate of cerebral blood flow or in arterio-venous differences in O₂ or glucose. The cerebral blood flow may be doubled or halved by breathing a mixture high or low, respectively, in CO₂.

WARREN M. SPERRY (Chem. Abstr.).

Histochemical and Action Potential Studies on Epileptogenic Areas of Cerebral Cortex in Man and the Monkey. Pope, Alfred, Morris, Arthur, A., Jasper, Herbert, Elliott, K. A. C., and Penfield, Wilder (McGill Univ., Montreal, Can.). [*Proc. Assoc. Research Nervous Mental Disease*, **26**, 218-33 (1947).]

Epileptogenic areas were produced in monkey brains by the application of alumina cream (C. A., **36**, 6668⁷; **39**, 1461³). Such areas also were obtained at operation from human brains. The interstitial pH was no less in these areas of monkey brains than in normal areas; in some animals there was a slight, variable increase above normal. Indophenol oxidase activity was normal as determined on fresh frozen sections of epileptogenic areas from human brains. Cholinesterase was increased above normal in these areas of both human and monkey brains.

WARREN M. SPERRY (Chem. Abstr.).

Metabolic Studies in Paroxysmal Paralysis. Jantz, Hubert (Univ. Freiburg, Ger.). [*Nervenarzt*, **18**, 360-78 (1947).]

Biochemical studies were carried out during 68 attacks of paralysis in 9 patients with paroxysmal paralysis. Some of the attacks were spontaneous; others were induced by the administration of insulin and glucose or desoxycorticosterone. Without exception a decrease in serum K concentration occurred during the attack, to about 13-15 mg./100 ml. for mild attacks and to 6-8 mg. when the paralysis was severe. With remission the K concentration returned to the normal level of

about 20 mg./100 ml. Great care was taken to avoid hemolysis. Between attacks all of the serum K was ultrafiltrable, but during the paralysis only a portion, sometimes less than half of the reduced amount, was found in the ultrafiltrate. Balance studies showed no increased excretion of K in urine and feces during attacks. The K concentration of muscle, taken by biopsy at the height of a severe attack, was 710 mg./100 g. Another muscle sample, taken from the same patient $\frac{1}{2}$ hour after remission, contained 360 mg./100 g. No changes in the Ca, Na, or Mg concentrations of the serum occurred, but the creatine (I) concentration dropped sharply during attacks, sometimes almost to zero, and the inorganic P concentration also was reduced to approximately 0.5 the normal level. (I) was excreted in the urine in considerable amounts by a male patient during symptom-free periods but the excretion almost ceased during an attack. There was no compensatory increased excretion during the following period. (I) and P concentrations in muscle were unchanged during an attack. Administration of K by mouth, as KCl or other K salts, in doses of 15 to 20 g. KCl, caused a complete remission of the paralysis within 1 to 2 hr. without exception in 57 trials. However, K therapy had no prophylactic action against the paralytic attacks. The results are explained by the hypothesis that a lack of ionized K inhibits the normal cleavage of creatine phosphate in muscle, with a resultant paralysis.

WARREN M. SPERRY (Chem. Abstr.).

Potassium Concentration in Human Gastric Juice with Special Reference to Parasympathetic Stimulation During Insulin Hypoglycemia. A Clinical Study. Saemundsson, Jóhann (Södersjukhuset, Stockholm). [*Acta med. scand.*, **130**, Suppl. 208, 139 pp. (1948).]

The gastric juice was obtained from patients by one of the following procedures: before and after histamine stimulation; during insulin coma; before and after histamine followed by insulin stimulation. In the first group the K concentration was 70.0–74.6 mg. per cent. and the average pepsin concentration was 63.2–89 γ /c.c. 1:100. In group II, patients with hyposecretion showed a K concentration of 81.2–84.9 mg. per cent. and of pepsin 27.2–63.6 γ /c.c. 1:100; while patients with various gastro-intestinal diseases had a K concentration of 66.6–78.5 mg. per cent. and of pepsin 55.1–97.9 γ /c.c. 1:100. Statistically, the higher K concentration of patients with hyposecretion as compared to the first group (normal) was significant. The pepsin concentration was lowest in the group with hyposecretion, and in all cases the concentration was increased after histamine stimulation. In persons without definite gastro-intestinal disease the K concentration at the height of secretion after histamine was not affected either by the volume or by the concentration of HCl. In insulin coma the free HCl was, on the average, 73.9 and the pepsin concentration 161.3 γ /c.c. 1:100. The latter was 1.8 times greater than the highest value found after histamine in the normal group and 2.5 times greater than the average concentration during fasting and indicated that the gastric juice secreted during insulin coma was of the vagal type. The K concentration (56.2 mg. per cent.) was significantly lower than the average fasting "normal" value. In the group in which histamine was followed by insulin the fasting K concentration was somewhat lower (67.9 mg. per cent.) than in the "normal" group (73.7 mg. per cent.), but the difference was not significant, while the pepsin concentration was higher (79.2 and 63.2 γ /c.c. 1:100, respectively). In patients with duodenal ulcers the average K concentration increased significantly after histamine stimulation but decreased during insulin hypoglycemia. In patients with gastric ulcers before vagotomy the rise in K concentration after histamine was not significant; during insulin hypoglycemia there was a significant fall in K, but the values were higher than in the case of duodenal ulcers. The K rose to 91.3 mg. per cent. 40 minutes after histamine in gastric ulcer patients, but only to 75.8 mg. per cent. in cases of duodenal ulcer; it fell to 55.8 mg. per cent. 120 minutes after insulin, but only to 47.5 mg. per cent. in cases of duodenal ulcers. Here again comparatively high K values were found jointly with low pepsin values. In cases of duodenal ulcer after vagotomy the average K concentration (56.6 mg. per cent.) was significantly lower than the "normal" fasting concentration and the situation was similar to that in cases of gastric ulcer before vagotomy, the main difference being that after insulin the fall in concentration was less pronounced after vagotomy.

S. MORGULIS (Chem. Abstr.).

2. Pharmacology and Treatment.

Mode of Action of Parpanit on the Nervous Functions of the Normal Animal Organism. Grandjean, E., Fleisch, A., Baud, Ch., and Galetti, Ch. [*Helv. Physiol. Pharmacol. Acta*, **6**, C54-5 (1948) (in French).]

In normal human subjects, ingestion of 50-100 mg. of parpanit (1-phenylcyclopentanecarboxylic acid) causes elevation of threshold of patellar reflex, increase in amplitude of balancing movements, elevation of threshold of deep sensation perception, a slight decrease in muscle tone, and no change in tactile sensitivity of the skin. Injected subcutaneously in rabbits (8.40 mg./kg.) it causes a marked decrease in muscle tone without significant change in neuromuscular chronaxia. It appears to act on the receptor organs of deep sensitivity and decrease their excitability.

L. E. GILSON (Chem. Abstr.).

The Effect of Castration on the Action of Some Barbiturates. Cameron, G. R., Cooray, G. H., and De, S. N. [*J. Path. Bact.*, **60**, 239-46 (1948).]

Castrated male rats develop a lowered tolerance for quick-acting barbiturates such as pentobarbital-Na, but not for barbital-Na, a slow acting compound. Replacement of one of the missing hormones, testosterone, is followed by improved tolerance. Ageing of normal rats is accompanied by progressive, though not profound, lowering of tolerance. The altered barbiturate response indicates disturbance, probably reversible, of a functional relationship between the sex glands and the liver. It is known that liver inactivates sex hormones, and such hormones may be utilized as adjuvants or co-enzymes in liver detoxification.

JOHN T. MYERS (Chem. Abstr.).

Blood Vessel-Constricting and -Dilating Substances and the Epileptic Fit from Electric Shock. Laura, Luigi. [*Atti reale accad. peloritana*, **47**, 823-49 (1946).]

A discussion on the effects of acetylcholine, amyl nitrite, benzedrine and proserpine on the convulsions produced by electric shock.

C. SCANDURA (Chem. Abstr.).

Anticonvulsants. Toman, James E. P., and Goodman, Louis S. [*Physiol. Rev.*, **28**, 409-32 (1948).]

Epileptic seizures are associated with occasional, excessively rapid and uncontrolled local electric discharges in the gray matter. Even small groups of neurones, predisposed by acquired injury or by inherited defect, may be set off by a great variety of circumstances, which by self-propagation can lead to an involvement of the entire brain in a tonic-clonic seizure or to an anatomically limited manifestation.

Anticonvulsant drugs should act upon the non-neural lesion, upon the abnormally altered neurons to prevent their excessive discharge and upon normal neurons to prevent their response to an excessive discharge. These drugs include, in historical order, bromides, phenobarbital, and other barbiturates, various hydantoin derivatives, and 2,4-oxazolidinedione compounds. With the introduction of hydantoins the study of anticonvulsants has ceased to be a matter of trial and errors. In evaluating these drugs the final test is the clinical finding; convulsive disorders vary radically so far as therapeutic response is concerned, and the mechanisms of anticonvulsant action may also vary. From the clinical point of view, it is not the absolute potency of the drug which determines its usefulness but its therapeutic index, or the ratio between the dosage which causes untoward effects and that which adequately controls the seizures. Most of the compounds having anticonvulsant activity have an hydantoin, barbiturate, or oxazolidine nucleus. A 5-Ph group is important but not critical and may be replaced by a naphthyl ring but not by benzyl or cyclohexyl rings. Optimum activity among 5-phenyl 5 alkyl compounds is found with short alkyls, and are more effective than alkoxy or alkylmercapto homologs. Activity is increased by a reactive group at 4, especially by a carbonyl and by a 2-keto group. N-methylation at position 3 apparently improves the antimetrazol potency of all 3 groups of anticonvulsant compounds.

S. MORGULIS (Chem. Abstr.).

Anticonvulsive Action and Molecular Structure of Some Heterocyclic Pentagonal Compounds. IV. Dimethyldithiohydantoin and its salts. Hazard, René, Cheymol, Jean, and Smarzewska, Klaudia. [*Compt. rend.*, **227**, 736-8 (1948); cf. *C. A.*, **42**, 7443d.]

Dimethyldithiohydantoin shows remarkable anti-epileptic properties. It is prepared from an equimolecular mixture of isopropyl- α -oxynitrile, NH_4HCO_3 , and $(\text{NH}_4)_2\text{SO}_4$, and consists of white crystals, m. 142° , soluble in boiling water, alcohol, ether, cold C_6H_6 , and alkalies. It forms salts with metals and organic bases. The 50 per cent. lethal intravenous dose for mice is 350 mg./kg. Intravenous doses of 15 mg./kg. in rabbits protect them efficaciously against metrazole convulsions, but 50-mg. doses are even better. It is less efficacious in electric shock. All forms of the compound tested (salts of Na, Ca, Sr, Mg, and diethylamine) gave comparable sedative results; the effect lasted more than 2 hours. In dogs, 10 mg. given intravenously produced hypotension and depression; 50 mg. was fatal. When fed by mouth to rats, 0.1 g./kg./day for 25 days, the thyroid glands increased in size. It has little hypnotic action, so has this advantage over phenobarbital, and it has an experimental cardiovascular action that is not as dangerous as that of diphenylhydantoin. Furthermore, its feeble toxicity allows a larger therapeutic margin. These 3 anti-epileptics act differently, probably because they are localized in different regions of the central nervous system.

DOROTHY A. MEYER (Chem. Abstr.).

Influence of Certain Anticonvulsant Drugs on Audiogenic Spasms in Albino Rats. Cain, Jacques, and Mercier, Jacques. [*Compt. rend. soc. biol.*, **142**, 688-91 (1948).]

The noise-produced convulsive seizures were prevented by injection of phenobarbital (3 mg./kg.) or Na diphenylhydantoin (20 mg./kg.) 30 minutes previously.

Influence of Tridione (Trimethyloxazolidinedione) on Audiogenic Spasms. Mercier, Jacques, and Cain, Jacques. [*Ibid.*, 993-4.]

Subcutaneous injection of 300 mg./kg. gave protection.

L. E. GILSON (Chem. Abstr.).

Cerebral Metabolism in Metrazole Convulsions in the Dog. Gurdjian, E. S., Webster, J. E., and Stone, W. E. (Wayne Univ., Detroit, Mich.). [*Proc. Assoc. Research Nervous Mental Disease*, **26**, 184-204 (1947).]

Previous observations (*C. A.*, **39**, 5309²) on chemical changes in cerebral tissue during metrazole (I) convulsions in dogs, immobilized by dihydro- β -erythroidine were extended to a longer period of time after (I). The lactic acid (II) concentration increased to a maximum during the first minute after (I) and did not change appreciably during the following 16-minute period of intermittent seizures. The cerebral (II) concentration was not related to that of the blood. The phosphocreatine (III) concentration decreased at the start of a seizure but did not fall further during the following 16-minute period. Adenosine-triphosphate (IV) and glycogen (V) cerebral concentrations, and the ratio of cerebral to blood glucose (VI) concentrations did not change appreciably after (I). The same cerebral chemical changes were obtained in animals which breathed O. mixed with 4.5 to 7.5 per cent. CO_2 during the (I) convulsions. In these experiments the O. tension of cortical tissue was determined by the polarographic method and found to be maintained above the hypoxia level, although there were considerable fluctuations. These results show that the chemical changes are not due to hypoxia. Injection of (I) during severe hypoxia induces only a brief seizure with no change in (IV), (V), or (VI) cerebral concentrations, but with a large increase in (II), representing the combined effects of (I) and hypoxia, and with a decrease in (III) a little greater than in seizures with adequate O.

WARREN M. SPERRY (Chem. Abstr.).

The Effect of Certain Narcotic and Soporiferous Substances on the Chronaxial Excitability of the Vestibular Apparatus of the Rabbit. Hurynowicz, J. (Univ. Torun). [*Acta Biol. Exptl. (Warsaw)*, **14**, 211-20 (1947) (in French).]

The reflexes during narcosis (rolling of the eye, movement of the head, and nystagmus) produced by the administration of chloral hydrate, chloralose, avertine, NaBr, MgSO_4 , medinal, pantopon and scopalamine were observed.

H. H. SZMANT (Chem. Abstr.).

Toxic Effects of O-Tritolyl Phosphate. Scheid, Werner (Hamburg Univ., Ger.). [*Nervenarzt*, **18**, 56-66 (1947).]

Widespread poisoning by o-tritolyl phosphate (I) has been observed recently in Germany as the result of human consumption of commercial "torpedo" oil, which usually contains about 10 per cent. of (I). Scheid studied about 100 cases and describes in detail the symptomology and prognosis. In (I) poisoning not only the peripheral motor neurones, but also spinal tracts and centers are damaged. The condition appears to be the same as the so-called "ginger paralysis" (*C. A.*, **24**, 4849⁹).

WARREN M. SPERRY (Chem. Abstr.).

Conditions Modifying Convulsions in Animals. Toman, James E. P., and Goodman, Louis S. (Univ. Utah, Salt Lake City). [*Proc. Assoc. Research Nervous Mental Disease*, **26**, 141-63 (1947).]

Review of effect of hydration, body temperature and anticonvulsant drugs on seizure-threshold of animals.

WARREN M. SPERRY (Chem. Abstr.).

Studies in New Anticonvulsants. Merritt, H. Houston, and Brenner, Charles (Columbia Univ., New York, N.Y.). [*Proc. Assoc. Research Nervous Mental Disease*, **26**, 387-97 (1947).]

Over 700 compounds were tested for activity against electrically induced convulsions in cats. Approximately 10 per cent. showed anticonvulsant activity; of these only a few have been tested in epileptic patients. 5,5-Diphenylhydantoin was the most effective.

WARREN M. SPERRY (Chem. Abstr.).

The Treatment of Epilepsy with Sodium Diphenylenehydantoin. Fabing, Howard D., Gayle, R. Finley, and Hawkins, J. Robert. [*Proc. Assoc. Research Nervous Mental Disease*, **26**, 398-403 (1947).]

Na diphenylene-hydantoin is less toxic than dilantin (I) and is about half as effective as (I) against electrically induced convulsions in cats. It was effective in 60 of the 72 epileptic patients in whom it was tried.

WARREN M. SPERRY (Chem. Abstr.).

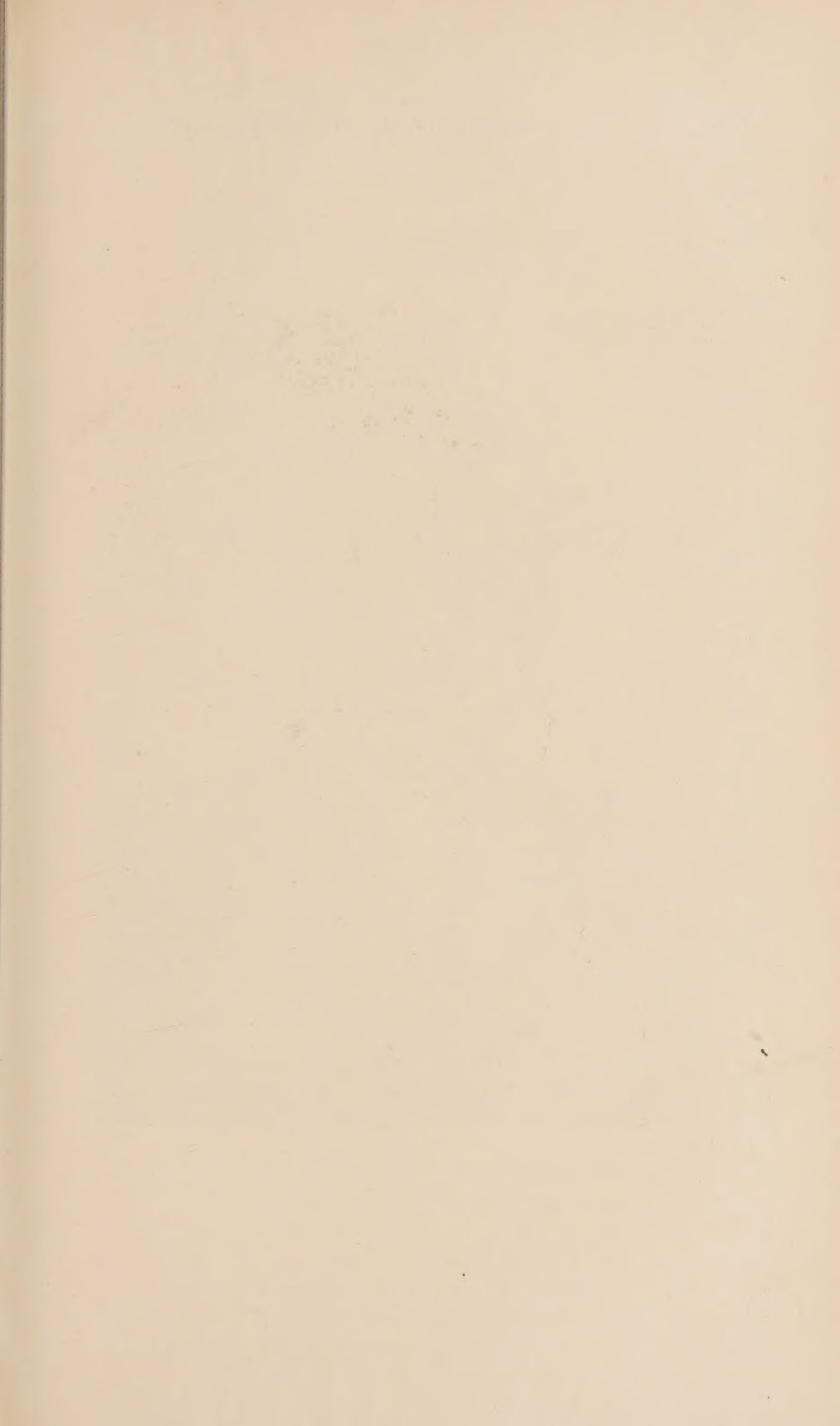
Salvarsan encephalitis. Winkler, Kurt (Krankenhaus, Berlin-Friedrichshain, Ger.). [*Z. Haut- u. Geschlechtskrankh.*, 1946, 201-4; *Chem. Zentr.*, 1947, **1**, 236.]

When properly used, salvarsan not only shows a highly specific action, especially against *Spirochaeta pallida*, but also is seldom toxic. Hypersensitivity to the drug cannot be recognized in advance. The appearance of a headache after injection of the salvarsan is the first symptom of a threatening encephalitis and demands the greatest care.

M. G. MOORE (Chem. Abstr.).

New Ideas on the Mechanism of Narcosis. Velázquez, B. Lorenzo, and Membrado, J. Elío (Inst. méd. expil., Madrid, Spain). [*Trabajos inst. nacl. cienc. méd. (Madrid)*, **3**, 271-9 (1943-44).]

F. FROMM (Chem. Abstr.).





J. IVISON RUSSELL, M.D., F.R.F.P.S., D.P.M.

President,
1949-50